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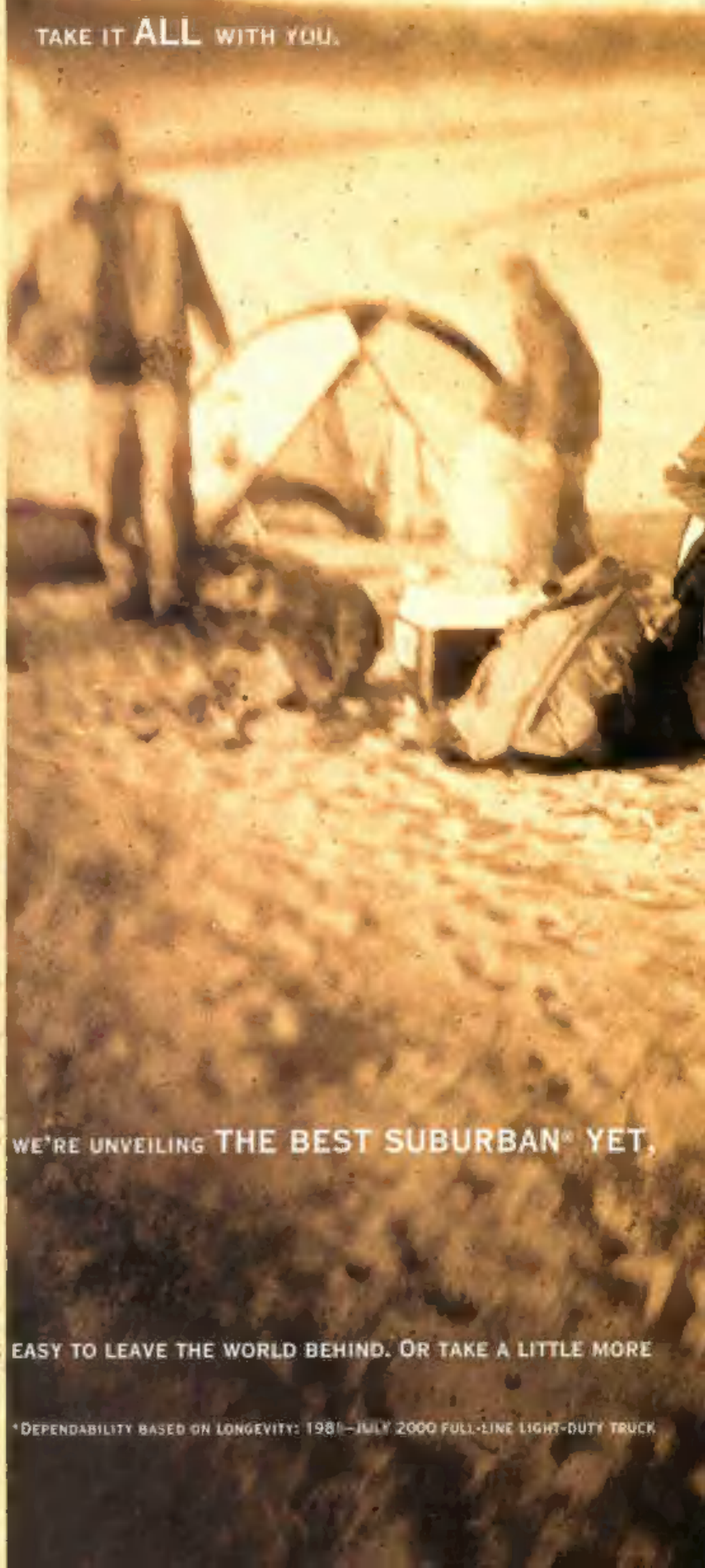

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THE COVER

Simon the Maltese poses with the wolf Koda in a canid family photo covering at least 14,000 years. Wolf and dog provided by Doug Seus's Wasatch Rocky Mountain Wildlife, Utah.
BY ROBERT CLARK

Cover printed on recycled-content paper

ON THE NGM WEBSITE

nationalgeographic.com/ngm/0201
SIGHTS AND SOUNDS See Europe's new vision of unity.
ISLAM Learn about Muslims living in the United States.
DOGS Meet the dogs used in the Pentagon recovery effort.

TODAY

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TOMORROW

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Of course, no one ever said that looking after the Earth's resources is easy. But as we continue to strive for greener ways to do business, there's one thing we're definitely not wasting. And that's time.

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From the Editor

STUART FRANKLIN

A shopping bag in Strasbourg carries the crisp logo of the euro, which this month replaces the French franc, the German mark, and ten other European currencies. In one stroke it presents a credible challenge to the dominance of the dollar. But it means much more than that, as T. R. Reid and Stuart Franklin show us in "The New Europe." The euro symbolizes the transformation of passionately independent countries into a community determined to unite, and just as determined to figure out what that unity means to their national identities. In the year 2002 what does it mean to be a German? An Italian? A Belgian? A European?

Western Europeans now move easily, without passports, across most national borders; business and cultural contacts have never been closer. And a flood of immigrants from Africa, Asia, and the former Soviet-bloc countries is joining them. The result: Western European nations are beginning to resemble the kind of ethnic stew more familiar in New World nations like the United States or Argentina.

Over its history, ethnic pressures and struggles for power have repeatedly plunged Europe into war. Now the continent is being reinvented by peace, which, should it break out for good, would set a priceless example for the rest of the world.

Bill Allen

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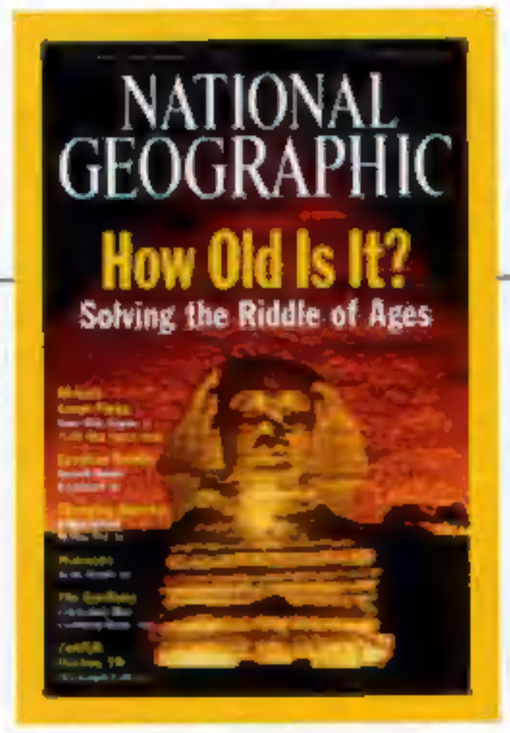
Forum



September 2001

The story of teenage immigrants in "Changing America" prompted readers to reflect on the multicultural nature of the United States. One wrote that the U.S. has "undermined its very foundation by throwing open its doors to all peoples." Another declared that "this diversity enriches the public school experience of my American-born, Jewish-Irish daughters. It is what makes America so beautiful."

Changing America

If we continue our present course—of at least a million immigrants a year, including all the illegals, coming to a country with the highest birthrate of any industrialized nation—we are headed for disaster. It is not a case of who these people are or where they come from, but rather how many people we can absorb without damaging the environment, polluting the very air we breathe, and clogging our highways beyond use. It's useless to moan about the environment until we do something to stop the flood. Everyone who steps ashore will want to drive a car, use energy, need social services, and generally take up space. At some point the very things the immigrants came for will be gone.

BARBARA DUDA
Marietta, Georgia

Many of us fear the burden of immigration on the economy, a dilution of American character, or a cacophony of languages we can't understand. As a Californian I have seen the anti-immigrant sentiment rolled out with every state election. But as you report, only 0.7 percent of the United States claims Native American ethnicity, which shows that few of us are in a position to make any territorial claims. Immigration is human history. As a child of an American parent and a foreign-born parent, I owe my life to it.

EDUARDO LACALLE
Berkeley, California

I think you totally missed the point these kids were trying to tell you. There are more important things to them than worrying about who is what race. You guys grew up in a different era, and it seems you are surprised that this school is such an open place where people are not afraid to be themselves. To me your article just told me about my own school. I would be worried and scared if I didn't come to school and see at least ten different races. As many of the students told you, coming to America was a new beginning for their families. Coming here meant not feeling confined to live your lifestyle or culture in private. They don't want to sit around and talk about where

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How Old Is It?

I was disappointed by your reference to the Shroud of Turin. I recall that you ran an article on the carbon-14 dating of the shroud shortly after the work at the University of Arizona in 1988. It was a fair representation of the scientists' work. In 1996, however, Leoncio Garza-Valdes, a doctor from San Antonio, said he found bacteria on the sample, casting doubt on the process used to date the shroud.

TONY B. SARSAM
Dublin, California

Your article on the methods of estimating age mentioned the Shroud of Turin as 610 to 740 years old based on carbon-14 dating tests. This observation was stated as fact. In fact, the results of those tests have been disputed. Scientists have questioned the impact of fire and smoke on the cloth that occurred during the past millennium. Please give both sides when challenging a mystery that has not been put to rest.

W. KIM HOWARD
Hickory, North Carolina

While some scientists have indeed questioned the purity of the sample, this is the only test whose results have been published in a peer-reviewed scientific journal.

Having taught earth science and astronomy in high school for nearly ten years, I am always talking about the ages of rocks, fossils, stars, and the universe. I assure my students

MILLER, BROOKS INSTITUTE OF PHOTOGRAPHY

that scientists aren't just grabbing numbers out of a hat. There are logical, reasoned processes behind them. This article spelled out those processes in wonderful detail.

RAY STUBBLEFIELD
Ridgeway, Virginia

they came from. They are here now and ready to live a free life.

NICOLE H. RASMUSSEN
Crystal, Minnesota

I wonder why immigrants feel they should forget their culture, heritage, and beliefs when they come to America. Aren't these kids' parents concerned about their losing their identity? Do we want our children to be uniformly identical, all poster children for the Gap?

JOSEPH L. HEADRICK
Iowa Park, Texas

I found myself delighted as I read "Changing America" until I came to the part about students, many of whom are white, using the word "white" pejoratively. While the beginning of the story had me convinced the school was indeed a racial blender, I came away convinced that there was a short in the blender. Equating the white race with "bad" is just as bigoted as equating people of color with "stupid and evil." Where are the new immigrants learning this?

JOSEPH CADRIN
Yorktown, Virginia

I feel compelled to write about a curious oversight in the article. Kenneth Prewitt, former director of the U.S. Census Bureau, says that America is on its way "to becoming the first country in history that is literally made up of every part of the world." Yet you state that while America is 10 percent foreign-born, Canada is 17 percent. As a Canadian, I am proud that we do not favor the American "melting pot." We encourage immigrants to keep their language and culture, rather than shedding it in order to blend in. So while the claim that America will be the first truly multicultural nation is a bold one, your own numbers show that Canada is closer to that goal by almost double.

QUINN DUNKI
San Francisco, California

Mr. Prewitt was referring to the diversity of cultures in the United States, not to the proportion of immigrants living in the country.

In Canada the federal government has espoused the mosaic rather than the melting pot. The idea is that the various groups will bring their culture and language to Canada to enrich everyone. It also probably gives rise to ethnic political bosses and prevents people from entering the mainstream of Canadian life.

WRITE TO FORUM

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The French and English used to be referred to as the "founding races."

W. J. CURRAN
Ottawa, Ontario

Walruses

The article states that "thanks to the United States' Marine Mammal Protection Act of 1972, the Atlantic population is growing." This statement confuses me. How is it that an American piece of legislation is responsible for the increase in population of walruses in the middle of the Canadian Arctic? The last I was aware, Canada and the Canadian people were not subject to U.S. laws.

MIKE WIERDSMA
Russell, Manitoba

There are two reasons for the rise in the walrus population: The protection act prohibits United States citizens who hunt in Canada from bringing walrus oil and ivory over the border, and Canada passed laws that allow only subsistence hunting of walruses by the Inuit and ban the export of hides and tusks.

Wildlife Without Borders

I have just returned from a two-week safari in South Africa. I was able to see a multitude of species thriving in a carefully managed environment when I stayed at an enormous game reserve that is primarily for hunting. Many readers may be shocked to learn that the future of African wildlife rests in the hands of the big-game hunting community. This industry legitimately puts millions of dollars into continental Africa annually.

I am thrilled the governments of the southern African countries are shifting back to the conservation effort as a means of promoting political, social, and economic harmony. My only fear is that when the fences come down, the governments will limit or restrict the hunting concessions. If so, poaching, as well as habitat destruction, will be rampant. People must understand that hunting is the most valuable tool in the conservation plan.

My only fear is that when the fences come down, the governments will limit or restrict the hunting concessions. . . . Hunting is the most valuable tool in the conservation plan.

PAUL ALLEGRA
Red Bank, New Jersey

Africa Map

While in Sudan this past March I visited people in the south, one of the fastest growing Christian populations in the world. Your map does not give this statistic, and it's important because untold numbers of southern Sudanese have been killed because they follow the Christian faith. Millions of Sudanese have been displaced due to bombings, slave raids, and atrocities.

KEVIN STECKLINE
Morris, New York

You are correct about the treatment of Christians in Sudan. In fact, the persecution extends to any non-Muslim group. Our map highlighted one or two of the most populous religions for each country. Most sources list Sudan as 70 percent Muslim, 25 percent indigenous beliefs, and 5 percent Christian.

ZipUSA: Dayton, Tennessee

The article was very positive and uplifting. Maybe it will encourage others that it is possible for communities to have a peaceful place to live if the right values are taught.

SUSAN BROWN
Barling, Arkansas

Your article "Changing America" does not apply to Dayton, Tennessee. People in that community ostracize those who do not practice their religion or share their values. They are very insulated and have little tolerance for outsiders.

CHARLOTTE MANDEL
Brooklyn, New York

Geographica

In "Thermometers a Hot Issue" you claim that mercury from just one thermometer can contaminate an 11-acre lake. You went on to assert that broken thermometers add some 17 tons of mercury to the U.S. waste stream annually. Who counted them, weighed a sample, and made an estimate?

TRAVIS JACKSON HÄGLER
Huntsville, Alabama

The estimate of 17 tons came from EPA data collected in the late 1980s. The agency now says a more reasonable estimate for today is four to five tons, due to a move from mercury to digital thermometers.

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Life in a Teeming Seabird City

In an oil spill, they're sitting ducks

It's bedlam on the bluffs in Alaska's tiny Barren Islands, crowded by half a million nesting seabirds. How do they cope? Each species lives and hunts in a different ecological niche.

More than 30,000 small gulls called black-legged kittiwakes form mud and grass to build nests on the islands' bare cliffs. Amid them 23,000 common murres build no nests; their pear-shaped eggs roll in tight circles, helping prevent falls over the edge. About 2,000 glaucous-winged gulls nest atop ridges. Below the ridges, more than 150,000 fork-tailed storm-petrels nest in crevices of rocky talus. In deep soil, an equal number of tufted puffins (*lower*) dig burrows.

Storm-petrels fly at night to pluck plankton from the sea. By day kittiwakes prey on small fish, but only near the surface. Puffins and murres dive deeper for many of the same fish—murres as deep as 720 feet.

Seabird numbers [illegible] The Barrens, part of a national wildlife refuge, host one of more than 2,000 colonies in Alaska and eastern Russia, totaling about 80 million birds. In an oil spill seabirds are among the first to suffer. The 1989 *Exxon Valdez* disaster killed about 250,000 seabirds, many from the Barren Islands.

[illegible]

For a listing of resources and links [illegible]

AOL [illegible]

BOTH BY KAREN KASMAUSKI

COASTAL
SITES

NGS RESEARCH GRANT

Unlooted Tomb Revealed

Syrian site may be the lost city of Tuba

A spectacular three-layered tomb dating from one of the world's earliest urban civilizations has been discovered in Syria. National Geographic Society grantee Glenn Schwartz and his Dutch colleague Hans Curvers led the team that uncovered the 4,300-year-old mud-brick structure at a site known as Umm el-Marra, some 200 miles northeast of Damascus. The perfectly intact tomb housed within its top level the bodies of two richly adorned young women, each curled around an infant. The second level contained far fewer objects and the less ornamented bodies of two men and a third infant; the bottom level held the body of an elderly man.

The ornaments, gold jewelry, and other finely crafted objects surrounding the bodies suggest that some of the people buried there held elite status. "Were the women royalty? Were they sacrificed or victims of an epidemic? Are the men and the babies there to accompany them in some way? These are the questions we are thinking about now," explains Schwartz, professor of Near Eastern Studies at Johns Hopkins University. "It's very unusual to find a rich tomb this old that has never been looted," he says. "We don't have similar elite tombs for comparison."

He might get some clues from a neighboring settlement though. When the ancient Syrian city of Ebla was first unearthed in the 1970s, archaeologists recovered 17,000 cuneiform texts. Some of these writings describe a thriving community in northern Syria called Tuba. Schwartz thinks the tomb at Umm el-Marra may be part of that long-lost city. "They're still going through all the Ebla texts," says Schwartz. "There could be more information there."

In the meantime there's more to excavate at Umm el-Marra. Schwartz is planning his return.

Depicting the Burial
The artist's rendering of the tomb's top level shows the two young women, two infants, and artifacts in the positions in which they were found. No clothing survived. The infants' swaddling is based on knowledge of similar cultures of the period. Clothing depicted on Syrian statues and carvings from the era guided the artist in dressing the women.

1st Level
The remains of two women and two infants were discovered here, along with gold and silver jewelry, lapis lazuli beads, and pottery.

2nd Level
Two men, an infant, a silver diadem, and a bronze dagger were buried here.

3rd Level
Contents include the bones of an elderly man and a silver goblet.

ART BY RICHARD SCHLECHT

APHICA

CREATURES OF OUR UNIVERSE

NATIONAL GEOGRAPHIC • JANUARY 2002

CONSERVATION

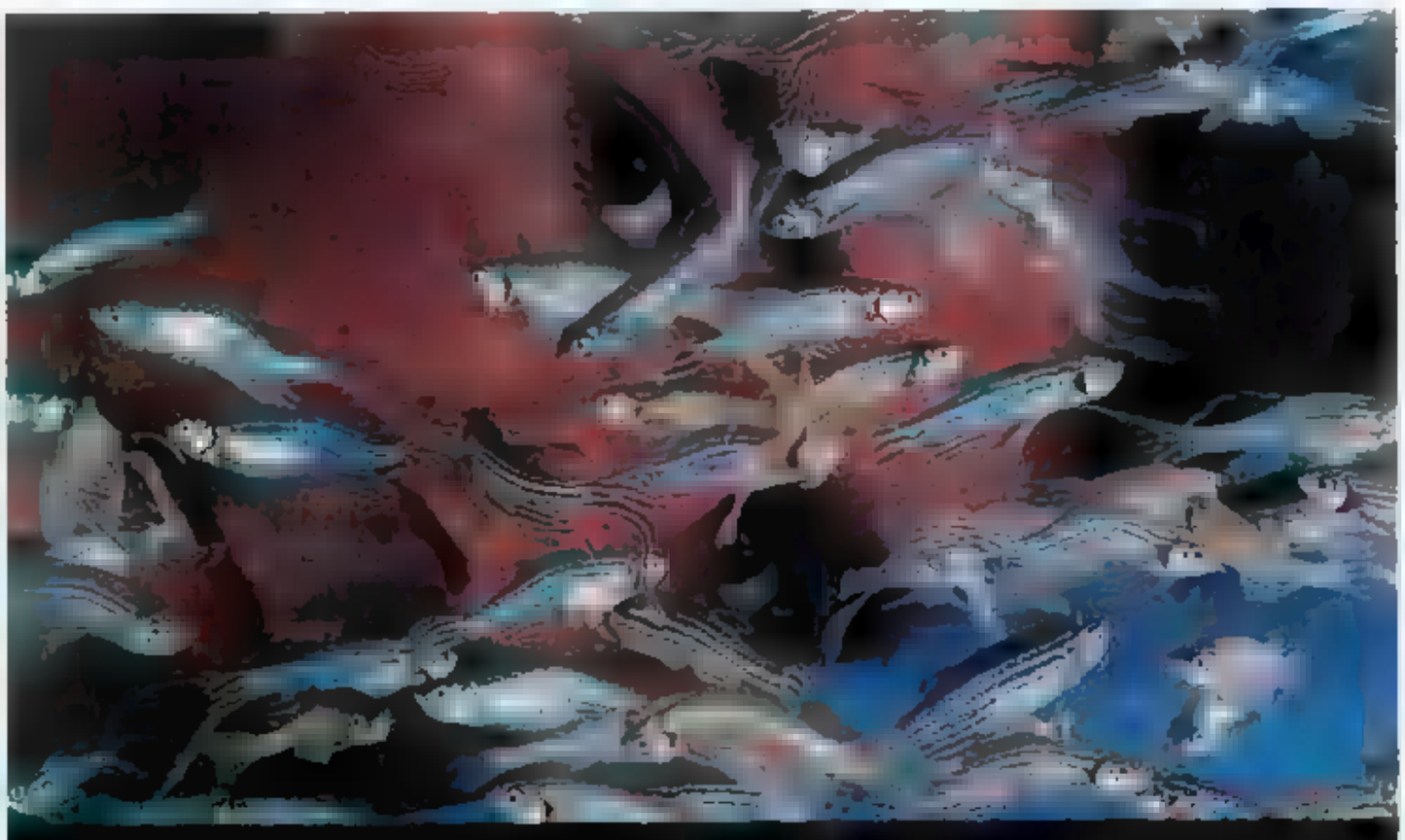
Beachhead on the Bay

Farm preserved as part of Chesapeake watershed

W. MADDEN

Each year about 24 million vehicles race over the Chesapeake Bay Bridge within an eagle's-eye view of a small natural treasure that will now be preserved—Holly Beach Farm. Instead of a dozen luxury homes that might have arisen on these 300 acres and three miles of western Chesapeake Bay shoreline, the welcome mat will remain for "our blue heron rookery, many ospreys, and a resident eagle family," says Leonie Labrot Gately. Her family, which has owned Holly Beach for nearly a century, agreed last spring to sell the farm to the Conservation Fund for 7.25 million dollars, about half the estimated value of the property. The private group will turn over the land to the Chesapeake Bay Foundation for an educational center. In the past 15 years the fund has brokered protection for some 150,000 acres in the Chesapeake watershed.

"I've lived here in a funny-looking old farmhouse for most of my life," says Leonie. "Some of the land has already been parceled off. It would have been a tragedy to develop the rest of it."



O. LOUIS MAZZATENTA

MEDICINE

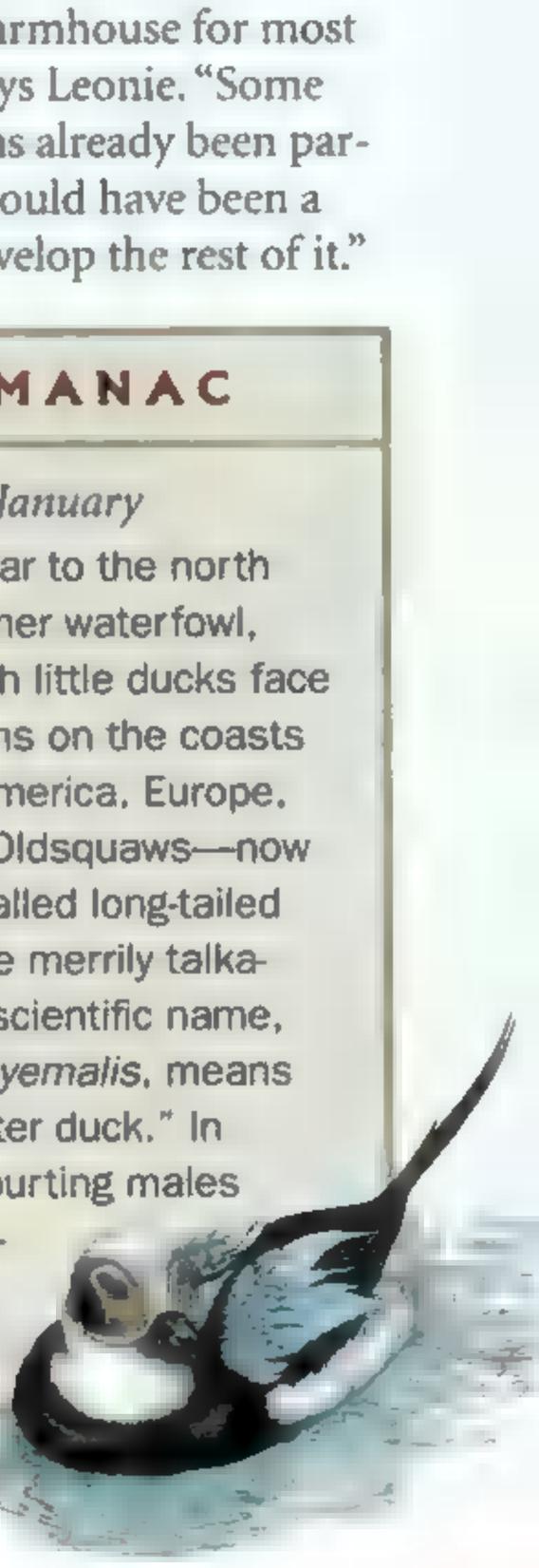
Genetic Research Goes Swimmingly

The newest kind of laboratory animal is a fish. Scientists found in a recent study that the common zebrafish has some genes that are identical to man's. The fish is now a major experimental model in human genetic work, according to researchers [illegible] (above) and Ajay Chitnis of the National Institutes of Health, where the world's largest zebrafish laboratory is being planned. Zebrafish embryos, in just weeks, are easy to keep, and their growth as transparent embryos allows scientists to watch from the first moment of fertilization.

ALMANAC

January

Wintering far to the north of most other waterfowl, some tough little ducks face frigid storms on the coasts of North America, Europe, and Asia. Oldsquaws—now officially called long-tailed ducks—are merrily talkative; their scientific name, *Clangula hyemalis*, means "noisy winter duck." In January courting males chorus *ow-owly, owly, owly!*



ART BY [illegible] HARPER

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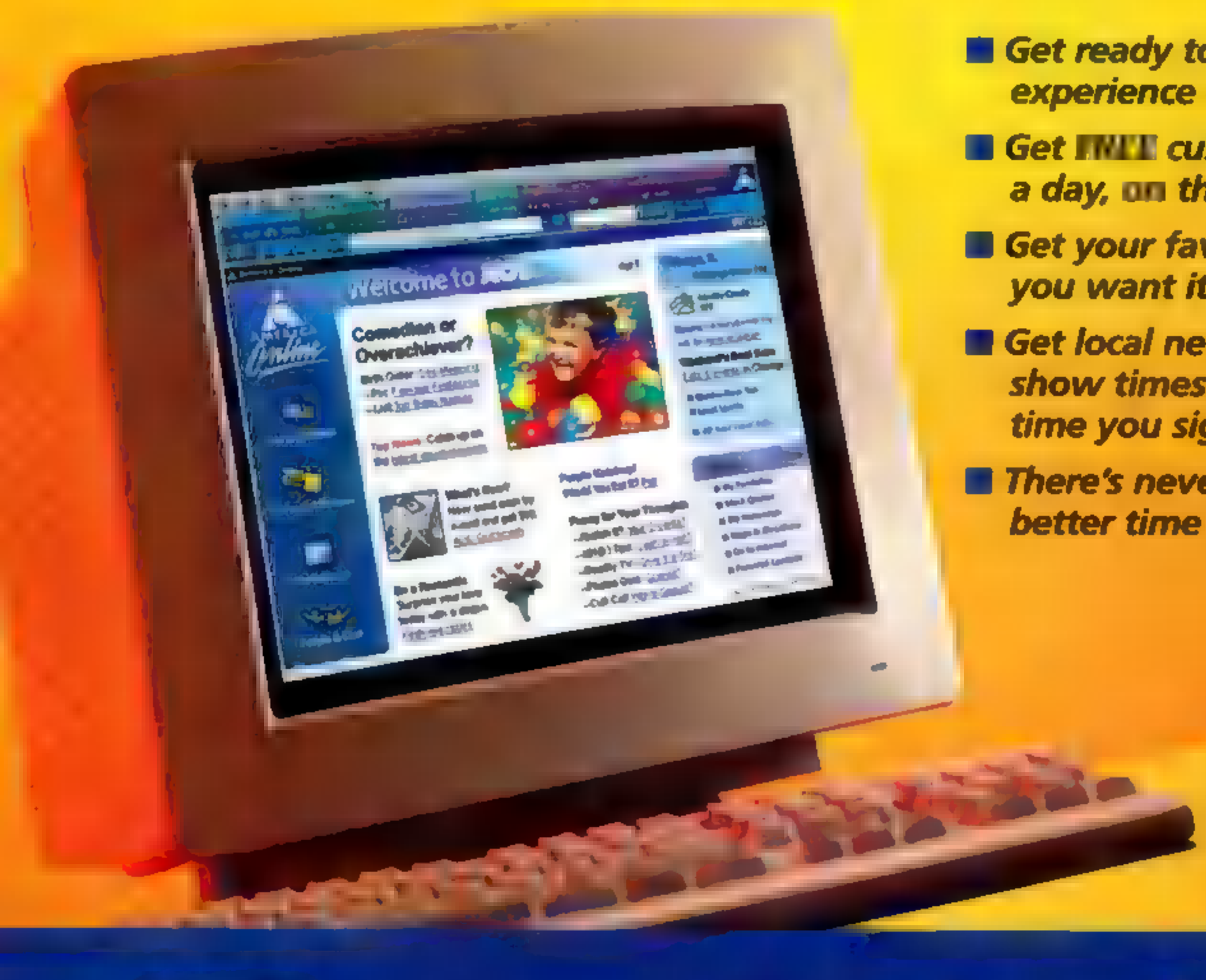

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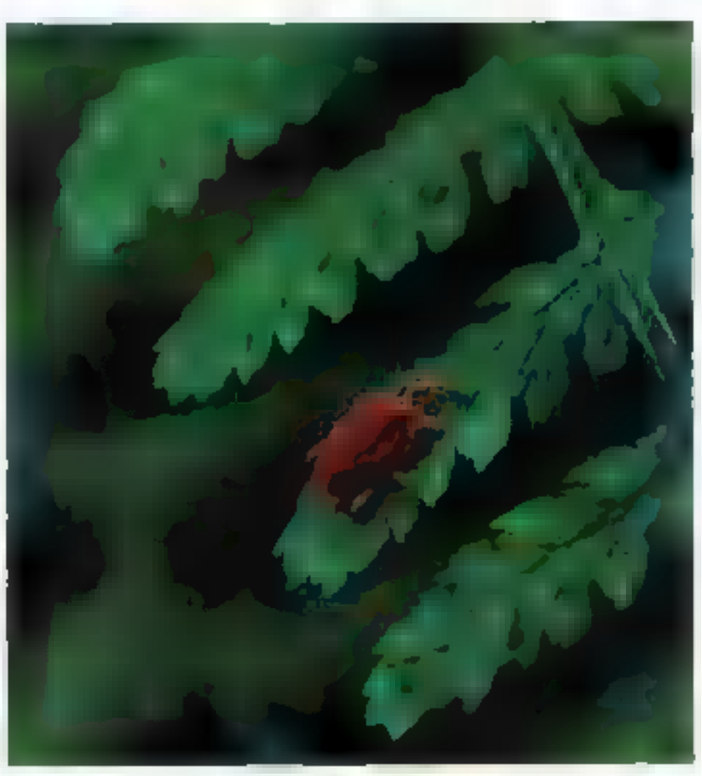
A Wish Comes True

Ailing teen joins photographer on wildlife assignment

DEAN SALING



For 18-year-old Chris Saling of Louisville, Kentucky, who has cystic fibrosis, it was "the trip of a lifetime." For photographer Joel Sartore, who spends much of his time dealing with "environmental train wrecks," it was "a chance to see people at their best." And for Robin Thierauf of the Make-A-Wish Foundation, it was "the most wonderful thing," fulfilling Chris's desire to work alongside ■ National Geographic wildlife photographer.

When Chris and his doctors contacted the foundation—which helps children with life-threatening illnesses realize their dreams—Robin called us. Susan Smith, assistant director of photography, swung into action.

Within days Chris and his father, Dean, were on their way to British Columbia, where Knight Inlet Lodge provided free rooms. Chris used Joel's camera gear as well as some provided by the Society, including a 600-mm lens (left), to make pictures of animals, from a velvet mite (middle) to ■ bathing beaver (bottom) to orcas. "The beaver put on a show for us," says the University of Kentucky freshman. "And I'd never seen whales before. They were majestic."

BOTH BY CHRISTOPHER SALING

Need a Map?

Since last fall we've sent updated maps of Central Asia to the White House, Congress, news organizations, and many schools across the nation. Additional copies of "Afghanistan," distributed with the December 2001 issue, and "Caspian Sea," from May 1999, ■■■ available for $8.99 each. "Afghanistan, Pakistan, and Middle East" costs $7.99. Part of the proceeds go to the Ferguson/Judge Fund for geography education. Order online: *nationalgeographic.com/maps*. Or call 1-800-962-1643 or look wherever maps ■■■ sold.

Innovation Earns an Award

Profession honors NGS library

"We're doing what we've always done," says Susan Fifer Canby, director of the Society's libraries (left). "We just do it differently now." What she and her staff do is serve as "information filters, coaches, and consultants." They helped build the Society's intranet and have invented ways to guide employees through the reams of information now available at our fingertips. The project won last year's Innovations in Technology Award from the Special Libraries Association—as well as, for Susan, cover status. The services have also won a following: 96 percent of our staff uses the electronic network, which complements our 50,000-volume collection.

COVER PHOTO BY KATHERINE LAMBERT, *LIBRARY JOURNAL* (TOP); © [illegible]/ATENTA

Water Marks

Students work to offset low national "river IQ"

These pupils from Harriet Tubman Elementary School in Washington, D.C.—studying Anacostia River fish with the help of Jesse Meiller of the Living Classrooms Foundation (in cap)—probably have a higher "river IQ" than most respondents in a poll funded by the Society. The poll, part of the "Geography Action! Rivers 2001" program, found that Americans support protecting rivers but lack knowledge of them. Few knew that 60 percent of our drinking water comes from rivers and the lakes they feed. More than half thought, incorrectly, that industry causes more pollution than runoff from cities and farms.

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MELISSA FARLOW

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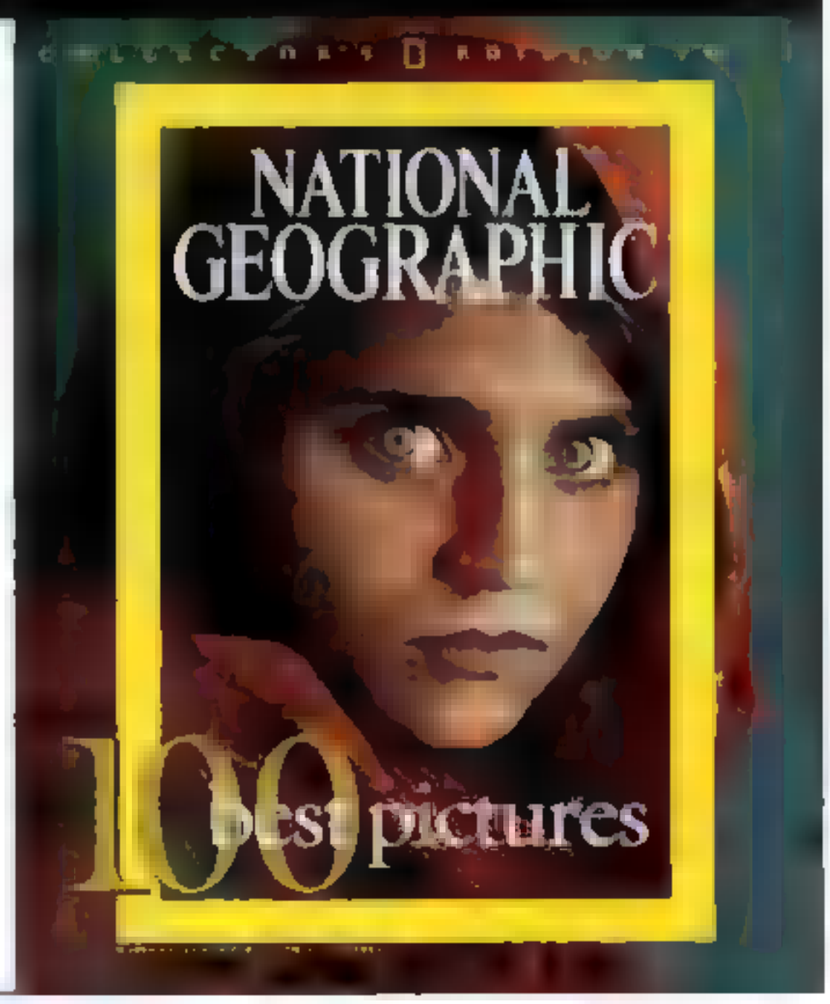
NGM 100 Best

How did Steve McCurry capture this startling image of an Afghan refugee? Discover the stories behind the photographs published in NGM's *100 Best Pictures*, on newsstands until January 31. The best of the best never looked so good at *nationalgeographic.com/ngm/100best*.



It's an environmental movement all by itself.

How many cars does it take to change the world? Just one, perhaps. Especially if it's the Insight from Honda, America's first gasoline-electric hybrid automobile.

Nothing short of an engineering breakthrough, the Insight achieves a terrific 68 miles per gallon on the highway, 61 miles per gallon in the city, and an astounding 700-mile range on one tank of fuel.* How? By combining an efficient three-cylinder gasoline engine with an electric motor powered by nickel-metal hydride batteries that never need to be plugged in. Then add a world-class aerodynamic design, and an extremely lightweight body, and you have the ultra-low-emission† Insight.

It's the culmination of years of research and development into lighter, cleaner, more efficient automobiles. In other words, technology with a conscience. Then again, what else would you expect from a car powered by Honda?

HONDA

The power of dreams.™

*Mileage figures based on EPA estimates for Insight with manual transmission. Actual mileage may vary. Range based on EPA highway mileage. †California Air Resources Board ULEV certified for California and some Northeastern states. LEV-certified in rest of country. ©2001 American Honda Motor Co., Inc. honda.com

National Geographic TV

Vietnam

While [illegible] of Quang Tri [illegible], a North Vietnamese [illegible] aids a comrade in an image taken by Doan Cong Tinh. Photojournalist Tim Page, who documented the U.S. side of the Vietnam War, returns to find Vietnamese photographers and view their newly seen work in *Vietnam's Unseen War.* The photographs are also in Another Vietnam: *Pictures of the War from the Other Side*—a new National Geographic book and an exhibit at New York's International Center of Photography.

NATIONAL GEOGRAPHIC CHANNEL, JAN. 20

Wonderlands

The deepest, highest, hottest, and coldest places on Earth have at least one thing in common: They are spectacular, as testified to by Sir David Attenborough, who journeys to the seven continents for *Greatest Natural Wonders.* His travels take him from white-water canyons in Yellowstone (right), the world's first national park, to the heights of Mount Everest, the depths of Death Valley, and the icy vastness of Antarctica.

ERWIN AND PEGGY BAUER, BRUCE COLEMAN, PICTUREQUEST

Programming information accurate at press time: consult local listings or our website at nationalgeographic.com. AOL Keyword: NatGeo

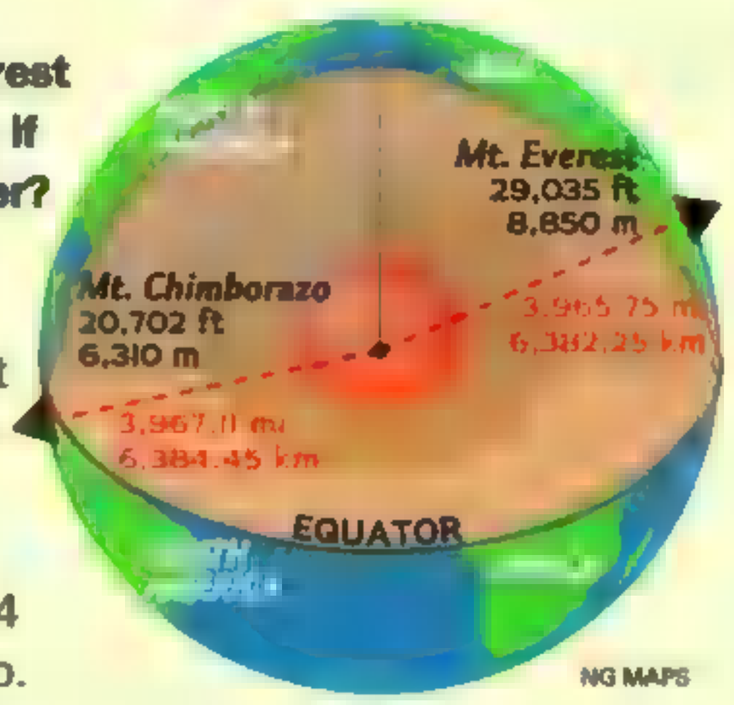
AskUs

THE ANSWER PLACE

Our Research Correspondence staff responds to questions from curious readers.

Q Is it true that Mount Everest is *not* the highest mountain, if measured from Earth's center?

A Yes. Earth's rotation causes an equatorial bulge that pushes Ecuador's Mount Chimborazo farther from the planet's center than Mount Everest. From sea level the 29,035-foot-tall Everest is 1.4 times higher than Chimborazo.



Q Do white lions still exist in the wild?

A Today there are fewer than 40 known white lions, and they all live in zoos or private reserves. However, one of these rare animals could be born at any time in its native habitat —the plains and scrublands of the Timbavati region of South Africa. White lions are neither true albinos nor a separate subspecies. Their unusual coloring is caused by a recessive gene carried by both parents. The white cubs mature to an ivory or cream color.

Q Who designed the Crazy Horse Memorial in the Black Hills of South Dakota?

A Korczak Ziolkowski, an American sculptor, agreed to a request by Indian elders in 1939 to carve the memorial in honor of the Oglala chief who fought settlers' expansion into the Great Plains. Korczak blasted and bulldozed the monolith, which he called Thunderhead Mountain, for 34 years until his death in 1982. His wife, Ruth, and their children continue to work on the memorial, projected to be 563 feet high and the largest mountain carving in the world.

Q Can you tell me where the hottest place on Earth is?

A Although Al-Aziziyah, Libya, is believed to boast the highest recorded temperature, 136°F, for annual average Dalol, Ethiopia, reigns with 94°F.

MORE INFORMATION

Send questions to **Ask Us, National Geographic Magazine, PO Box 96095, Washington, DC 20090-6095** or via the Internet to **ngsaskus@nationalgeographic.com**. Include name, address, and daytime phone number.

TELL US

Why will this wall eventually go up in smoke?

Think you know the answer? Go online to nationalgeographic.com/ngm/tellus/0201 and test yourself, or read it here in next month's issue.

December answer During mating season bucks spread their scent to females and competing males by thrashing trees, which often becomes caught in their antlers.

AURORA & QUANTA

Wolf

The Evolution

to Woof

of Dogs

Less than 14,000 years separates them: the wolf—the dog's ancestor—and the Maltese, one of hundreds of breeds of today's *Canis familiaris*. Humans transformed wild canids into the first domesticated animal—the tamable, trainable, incredibly variable dog.

By Karen E. Lange
NATIONAL EDITORIAL STAFF

Photographs by Robert Clark

The Human Dog Connection

About 12,000 years ago hunter-gatherers in what is now Israel placed a body in a grave with its hand cradling a pup. Whether it was a dog or a wolf can't be known. Either way, the burial is among the earliest fossil evidence of the dog's domestication. Scientists know the process was under way by about 14,000 years ago but do not agree on why. Some argue that humans adopted wolf pups and that natural selection favored those less aggressive and better at begging for food. Others say dogs domesticated themselves by adapting to a new niche—human refuse dumps. Scavenging canids that were less likely to flee from people survived in this niche, and succeeding generations became increasingly tame. According to biologist Raymond Coppinger, "All that was selected for was that one trait—the ability to eat in proximity to people."

At the molecular level not much changed at all: The DNA makeup of wolves and dogs is almost identical.

OLSENIUS

WOLF MALTESE DOG WASATCH ROCKY MOUNTAIN WILDLIFE, UTAH

Breeds Apart

One species, hundreds of faces

Bullmastiff

Great Chihuahua

Bulldog

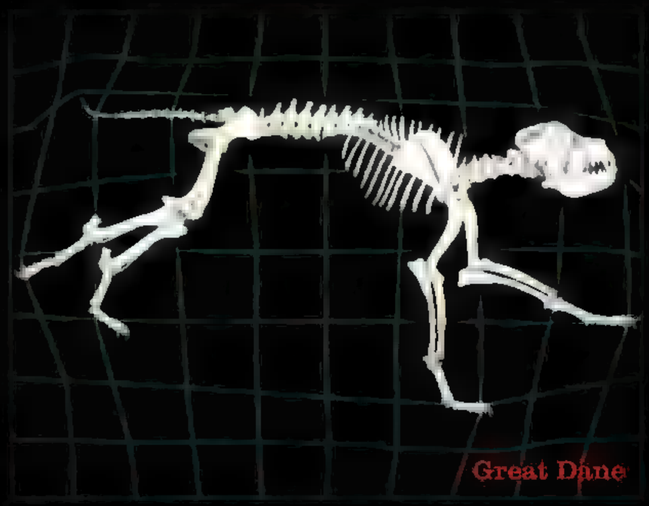
No other species displays such diversity as the dog. Raymond Coppinger calls the dog a shape shifter. Yet all dog breeds share certain characteristics, born of their common origin. As early canids adapted to human settlements, they developed tame dispositions and a host of genetically linked qualities including trainability, tail wagging and multicolored coats. No longer needing to bring down his prey, dogs developed skulls and teeth that were smaller, relative to their overall size, than a wolf's. Having gone from a diet of meat to eating human garbage, they developed smaller brains, which require less protein and fewer calories for growth and maintenance. The end product was an animal we would recognize as the mutt—similar to the medium-size, often golden-colored dogs that scavenge on the edges of towns worldwide. From this beginning the earliest breeds may have emerged with a minimum of human intervention as humans chose and reared dogs for abilities such as guarding or hunting. Environment also shaped early breeds. In cold climates, for example, larger dogs with dense coats could better survive to reproduce. Over the centuries humans began to crossbreed animals with desirable traits to produce hybrids, creating greater variation in shapes than would appear or survive in nature. These graphics show how the skeleton of the wolf has been manipulated—without losing a single bone. Much of the dog's variation was possible because of genes that affect the timing of its development as a fetus and puppy, which can greatly alter a dog's final shape. Unlike in cats, the heads of puppies are not just smaller

Borzoi

The Flexible Beast

Computer program based on CT scans of wolf and dog bones

Gray wolf



Great Dane

have been different proportions than the heads of adult dogs. For example, the skull of a bulldog (below, far left), with its pushed-in upper face and outward jutting jaw, is the result of nose growth that begins late and then proceeds slowly. The rest of its skull forms to fit the short nose. In contrast, the borzoi has a long and slender snout because its nose starts growing early—in the womb. The establishment of kennel clubs in the mid-1800s accelerated the process of artificial selection by encouraging new breeds. Most breeds established since 1900 were created simply for the sake of appearance.

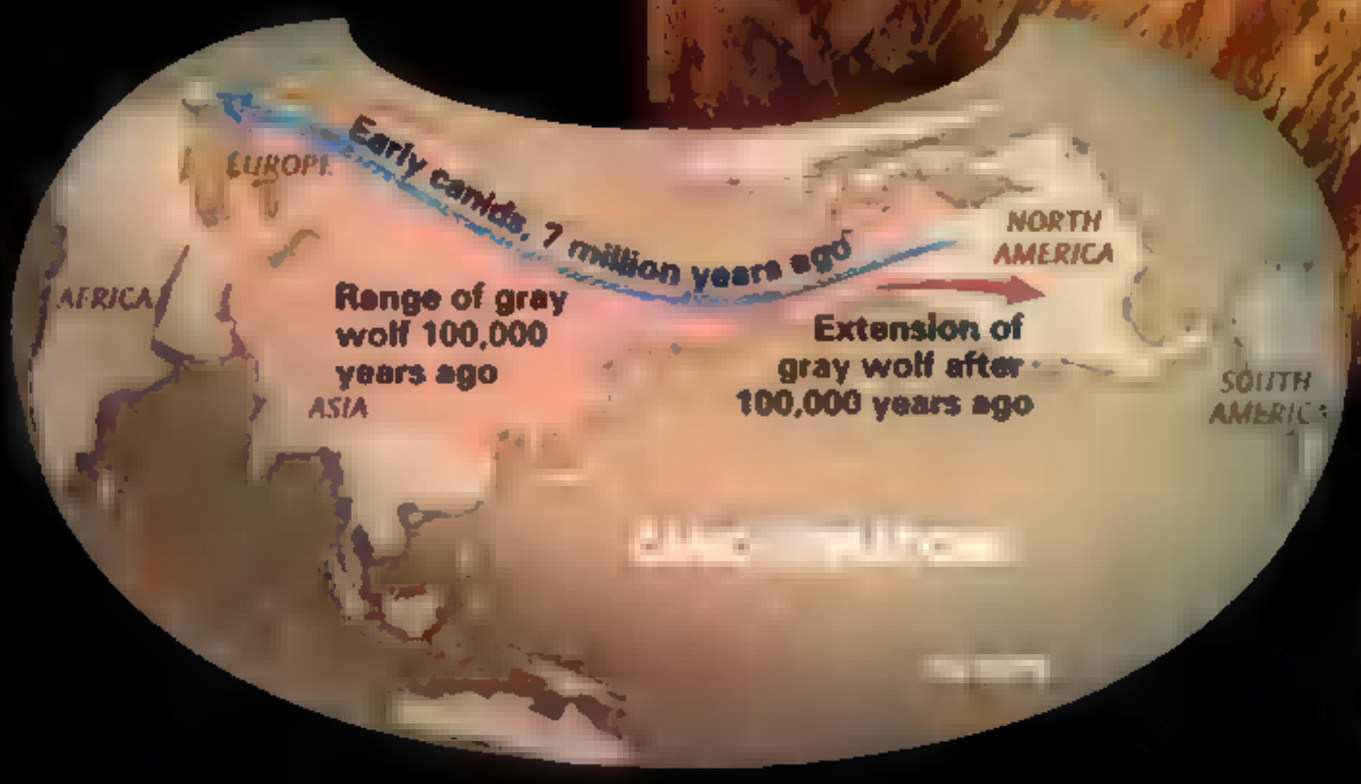
Dachshund

Pomeranian

SOURCE: ART BY ART ANDERSEN AND KYLE J. SMITH, VIRGINIA-MARYLAND BY SMITHSONIAN OF VETERINARY BLACKSBURG, VIRGINIA

Roots of the Dog

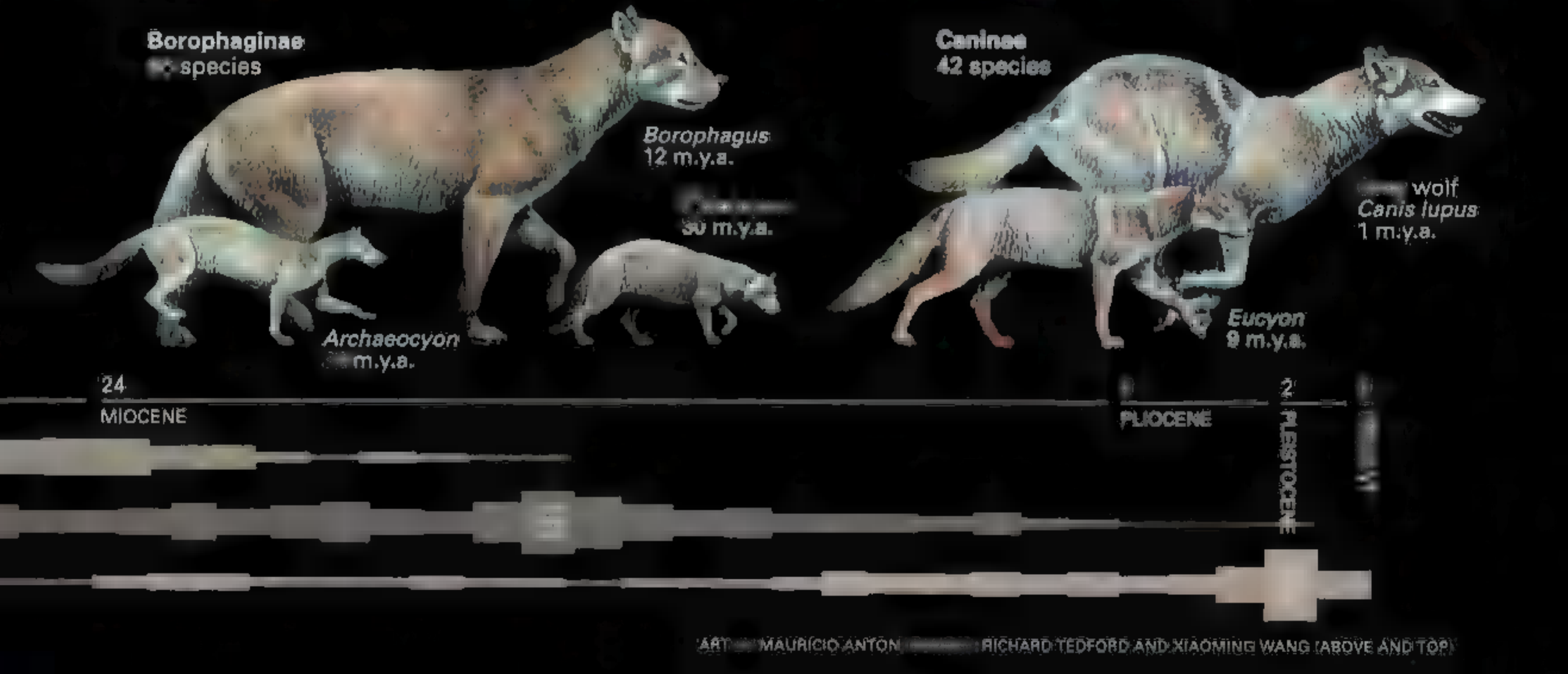
Eight million years ago on what is now the U.S. Great Plains, a powerful canid called *Eucyon*, the size of a large wolf, attacks a horned herbivore. Nearby a pack of fox-size *Eucyon* encircles an injured cub. As the climate cooled, *Eucyon* and others of the subfamily Borophaginae (*Cynarctus*, below) followed their large prey into extinction. Adaptable *Eucyon*, with teeth suited for eating both meat and plants, survived. *Eucyon davisi* migrated into the Old World (map), eventually evolving into wolves. About 800,000 years ago wolves crossed in Arctic North America.



Paths of Evolution

The dog lineage began 37 million years ago in North America in predators that had distinctive pairs of shearing teeth and ran down prey. Early canids reached Europe seven million years ago, but it was *Eucyon*, at far right, moving west six to four million years ago, that gave rise to most modern canids, including wolves, coyotes, and jackals.

ART BY [redacted] HALLETT



ART [redacted] MAURICIO ANTÓN [redacted] RICHARD TEDFORD AND XIAOMING WANG (ABOVE AND TOP)

Faithful Companions

The dog evolved in the company of humans and cannot exist without them. Even the vast majority living "wild" as village scavengers depend entirely to humans. That relationship has become so intimate that dogs are often viewed as extensions of humans, writes biologist James Serpell. "The domestic dog exists primarily in the mind of the human and nonhuman," neither predator nor beast. The ancients saw dogs as messengers between the living and the dead. Today dogs are often used in experiments that might threaten human lives.

the Dead

Wrapped to resemble a jackal, the mummy of a wild canine was left as an offering in an Egyptian tomb during Roman times. Egyptians did not consider dogs sacred but believed their wild cousin, the jackal (as the god Anubis), guided souls of the dead to the afterlife.

BRITISH MUSEUM, [illegible]

How to photograph a dog next to a tiny [illegible] Keyword: NatGeoMag

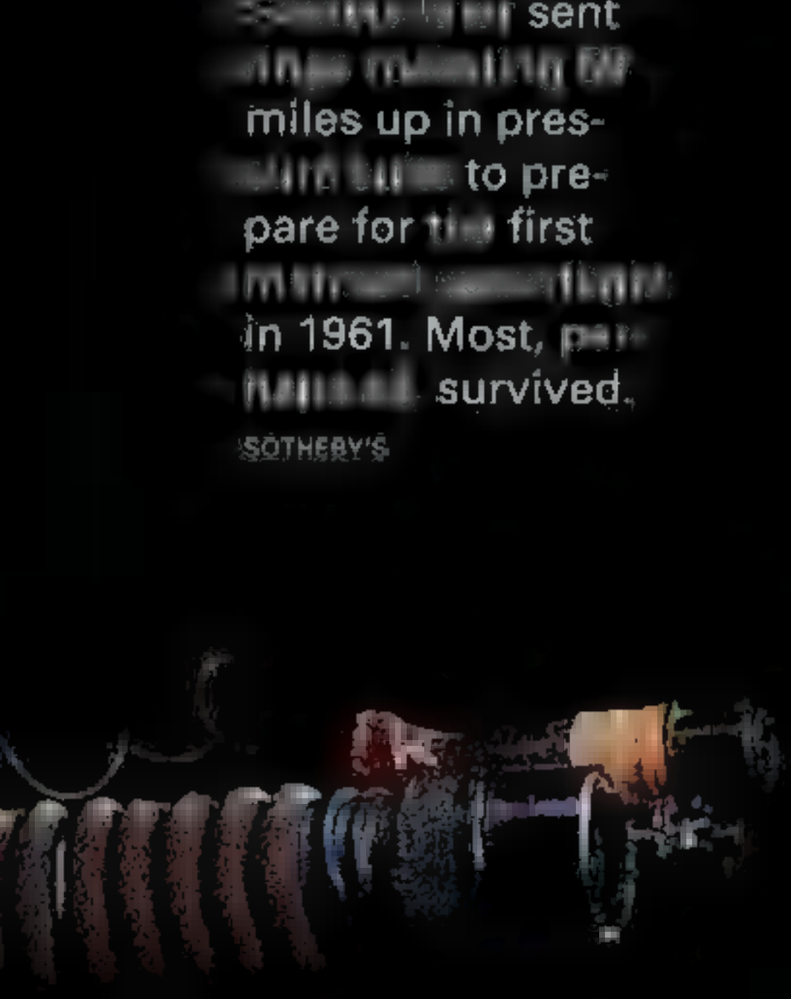
R

When [illegible] designed the robot [illegible] Alliance [illegible] the form of a dog [illegible] to the widest [illegible] market. "We consider it a [illegible] says spokesman [illegible] Piazza.

Cosmopups

In [illegible] a dog named [illegible] became the first creature to orbit Earth [illegible] the Soviet [illegible] satellite. She [illegible] sent [illegible] miles up in pressurized [illegible] to prepare for the first [illegible] in 1961. Most, [illegible] survived.

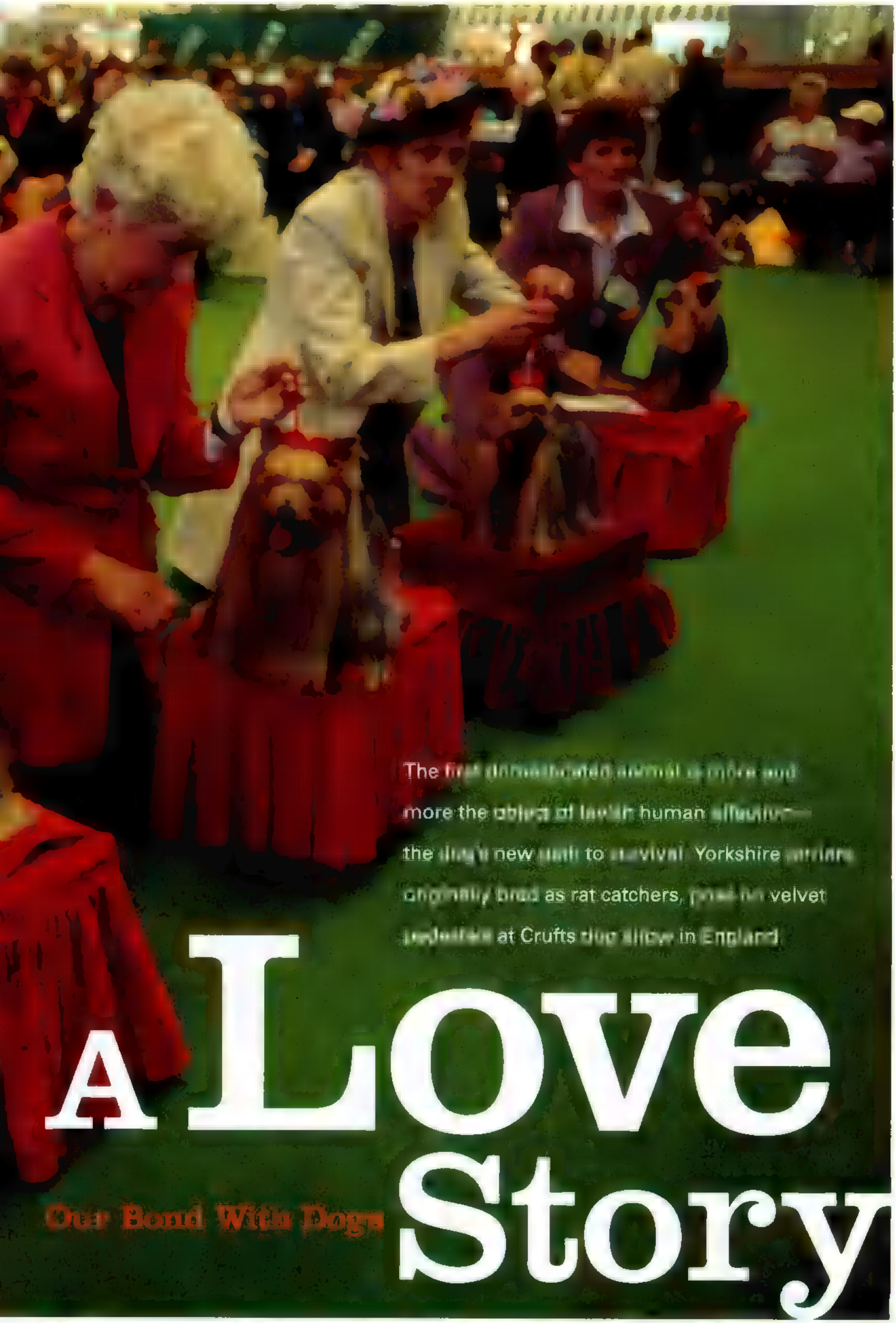
SOTHEBY'S



See [illegible] Rerun

[illegible] Hawthorne, [illegible] nator of the Missy- [illegible] crouches with [illegible], the [illegible] whose anonymous owner [illegible] $3.7 million to Texas A&M [illegible] Once researchers succeed, [illegible] is [illegible] that tens of thousands of [illegible] will be willing to pay $20,000 [illegible] to [illegible] animals.

RICHARD


The first domesticated animal is more and more the object of love in human affections
the dog's new rush to survival. Yorkshire terriers
originally bred as rat catchers, pose in velvet
outfits at Crufts dog show in England
A Love Story
Our Bond With Dogs

Roddy MacDiarmid, 57, lifelong shepherd and son of a shepherd, surveys the Scottish Highlands from a ridge overlooking Loch Fyne and the little valley town of Cairndow. On one hand lies the estate of John Noble, where MacDiarmid has worked much of his life, on the other the estate of the Duke of Argyll. Black-faced lambs and ewes by the hundreds dot the green hillsides below. His Border collies, Mirk and Dot, trot faithfully behind. It's familiar turf.

"Everywhere you see," says MacDiarmid, sweeping his shepherd's crook in an all-encompassing arc, "I have gathered sheep. And I can tell you this: You cannot gather sheep from these hills without dogs. Never could and never will; never, never, ever!"

That ringing endorsement is a comfort to those of us who keep dogs but sometimes wonder why. It's good to know that somewhere dogs remain absolutely, undeniably essential to man's work while we happily wander about with our furry friends, feeding them, walking them, scooping their droppings, showering them with affection, taking them to the vet at the first glimmer of trouble. We occasionally get nipped or barked at in return, but more frequently we are rewarded with a lick on the hand or a wagging tail or a rapt willingness to listen to our most banal statements, as if they are something profound.

By Angus Phillips
Photographs by Richard Olsenius

Dogs and people, people and dogs: It's a love story so old no one knows how it started. "The human beings who participated in the earliest domestic relationships [with dogs] thousands of years ago are all dead," says zooarchaeologist Darcy F. Morey with refreshing candor. "They cannot tell us what was in their minds or what they sought to accomplish."

And since no one had yet begun to write things down, we are left to speculate, as did the British writer Rudyard Kipling in 1912 when he offered this theory in *Just So Stories:*

"Then the Woman picked up a roasted mutton-bone and threw it to Wild Dog, and said, 'Wild Thing out of the Wild Woods, taste and try.' Wild Dog gnawed the bone, and it was more delicious than anything he had ever tasted, and he said, 'O my Enemy and Wife of my Enemy, give me another.'

"The Woman said, 'Wild Thing out of the Wild Woods, help my Man to hunt through the day and guard this Cave at night, and I will give you as many roast bones as you need.'"

That scenario (minus the talking dog, of course, of which there are none even today) would have played out about 14,000 years ago if you follow the archaeological trail to the origins of dogs, much further back if you favor DNA evidence suggesting dogs existed well before the earliest traces of their bones. Either way, this is clear: Dogs are not just our proverbial best friends in the animal world but probably our oldest. They evolved from wolves long ago, found a home alongside humans before history makes a record, and never left.

And why would they? Dogs profited handsomely from the association. As their closest kin, wolves, dwindled to scarcity, sociable, hard-working, malleable, adaptable, lovable dogs in myriad shapes and sizes proliferated alongside humans in the globe's every corner. Today there are about 68 million in the United States alone, one for every four people. And while a few still work for their daily cup of kibble, most get free rides. "Ninety-nine point nine percent of them do nothing but lie around the house, bark, and eat," says contemporary writer Stephen Budiansky, grossly overstating the case to make a point. His book *The Truth About Dogs* suggests dogs get a lot more

CHAMPION SWEETHEART Kerry Knott, 11, cuddles her family's winning weimaraner, Jarman Frosty Jack (pet name Roonie the Looney), after hours of judging at Crufts, the world's largest dog show. "He's a really good friend," she says. "I try to look out for him."

HOME OR THE RANGE Tiffy, a Maltese, leads a plush life on Manhattan's Upper East Side, cared for like a baby. "I have a dog because the dog needs me," says owner NancyJane Loewy. Montana rancher John Helle depends on Border collie Pirate to help move his sheep.

from the relationship than humans get back.

Well, they certainly aren't chewing many leftover mutton bones anymore. In her Park Avenue apartment on New York's Upper East Side, NancyJane Loewy feeds Tiffy, her fluffy, eight-pound Maltese, twice a day from an enviable larder. Along with her dog food, says Loewy, "I'll give her a little chicken for breakfast, some steamed baby carrots, steamed broccoli, and some sweet potato—a balanced diet. For dinner I might add lamb or steak or poached salmon or tuna with steamed vegetables. And for dessert some low-fat yogurt with no sugar, maybe just a teaspoon of strawberry or apricot yogurt to sweeten it, and a couple of red grapes sliced in half. Then I'll give her one or two Teddy Grahams, she likes those, and maybe some Pepperidge Farm Goldfish crackers for snacks."

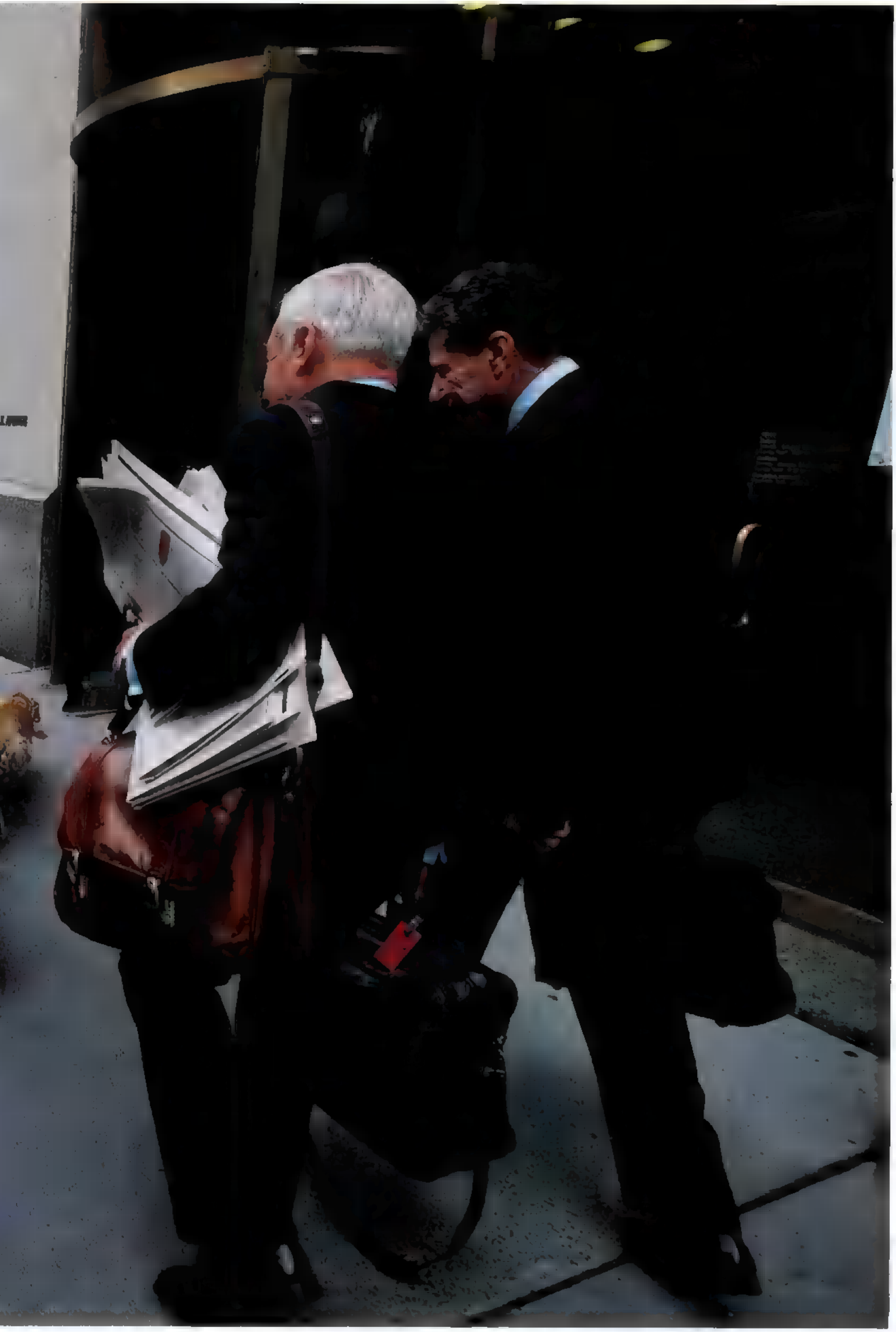
Loewy, whose husband is an investment adviser and whose two sons are away at school, has the time and wherewithal to treat Tiffy as she might royalty and delights in doing so. "I want to give her the healthiest, most wonderful life possible for as long as possible," says the slender New Yorker as the fluff-ball curls up alongside.

To that end Tiffy has a professional walker to take her to Central Park daily, is shampooed and groomed once every few weeks at Karen's, a pet emporium on Lexington Avenue, and belongs to a leashless and cageless indoor Manhattan dog club and day-care facility, Biscuits and Bath, where she can go for a few hours to exercise with peers under an attendant's eye.

Tiffy has a boyfriend, Bucky, who lives a few blocks away. "He's a handsome, fabulous male, and she's a beautiful, sensitive female," says Loewy of the happy canine couple. "We get together at least once a week for play days. Sometimes we go to the Stanhope Hotel for lunch," on a terrace where pets are permitted, "or we go to Bistro du Nord on 93rd Street and share a cheese-and-fruit plate with the dogs."

Not all today's dogs are as pampered, of course. Billy Dodson, huntsman for the Thornton Hill Hounds near Sperryville, Virginia, keeps a pack of 90 mostly Penn-Marydel

POOCH PARADE Ruth Hollimon talks commands and leans a manly mush as she maneuvers a pack of 11 dogs down E. 59 St. "It's like having a demon parade," she says. "You set the rhythm, and they move forward." Professional dog walkers are common in Manhattan, where the descendants of wolves bed down in high-rise apartments



foxhounds in an old cattle barn and fenced yard in the shadow of the Blue Ridge Mountains, where the hounds sleep rough in unpainted wooden barracks and live on a spartan diet. Dodson, who has worked with hounds for 40 of his 55 years, assembled the pack over a two-year span and "never paid anything for any of them," instead accepting donations and trades from other huntsmen, as is the custom in the foxhunting world. He subsequently crossbred some Penn-Marydels with American foxhounds to create his own unique subtype.

Dodson has a name for each of his charges and can pick them all out on sight, though they look much alike to the unpracticed eye. He even can identify them by voice. As we stand outside the barn one bright spring morning, a dog barks. "Shut up, Sarge," shouts Dodson, adding in an aside, "I won't keep a mouthy hound." Sarge, wherever he is behind those walls, dutifully pipes down.

Dodson takes pride in feeding his dogs for just a dollar a week apiece, though in winter he sometimes has to boost rations and it gets costlier. Once a day the ravenous, 60-pound hounds devour a heap of fatty scraps from an abattoir that processes buffalo meat, and Dodson augments the scraps with dry food he buys wholesale in 50-gallon drums.

As doted on, by contrast, as Tiffy is, she seems no more content nor fit than any of the hounds. They get to chase after foxes through

MASTERS OF SCENT

Nose deep in overseas mail, Jacques of the USDA Beagle Brigade in Miami sniffs out meat and other agricultural contraband (right) with an [redacted] percent accuracy rate eight hours a day. In Virginia foxhounds managed to track their quarry five miles, despite smoke from a forest fire, before returning to their trailer tuckered out.

dappled woods and fields three times a week with horseback riders in keen pursuit during the hunting season from August to March and are exercised twice a week in the off-season. They are lean athletes that take confinement in stride, waiting for the next chance to run.

I tag along for an exercise session with Dodson, who brings whippers-in to keep the hounds in check. A walk with his pack is as much an exercise in discipline as a physical exercise. The whippers-in snap their leather at dawdlers to keep the pack tight and focused on the huntsman, who with his horn and bag of kibble looks every bit the Pied Piper in overalls.

The whippers-in are Dave Ingram, a retired banker from Culpeper, and Beth Opitz, a housewife, foxhunter, mother, and hound lover from Berryville, who drives a couple of hours round-trip twice a week to help Dodson. Ingram says listening to the hounds chase a fox along a ridgetop on an autumn day "makes the hair stand up on the back of my neck." Opitz, who grew up with a pack of hounds her veterinarian father still keeps in Pennsylvania, loves foxhunting so much, she says, "If I got a second life and could choose how to live it, I'd live it as a hound." Short of that she keeps a pack of 17 beagles in a pen behind her house and uses them to chase rabbits twice a week with her husband and two children.

If Loewy, Dodson, and Opitz seem extreme in their affection for dogs, they are hardly alone. Dogs are kept in 40 million U.S. homes these days, and Americans spend billions of dollars a year on dog food and dog health care.

What then of this abiding affection of humans for dogs, and dogs of all stripes for humans? How and why did it start?

GENETIC STUDIES SHOW that dogs evolved from wolves and remain as similar to the creatures from which they came as humans with different physical characteristics are to each other, which is to say not much different at all. "Even in the most changeable mitochondrial DNA markers [DNA handed down on the mother's side], dogs and wolves differ by not much more than one percent," says Robert Wayne, a geneticist at the University of California at Los Angeles.

Wolf-like species go back one to two million years, says Wayne, whose genetic work suggests dogs of some sort began breaking away about 100,000 years ago. Wolf and early human fossils have been found close together from as far back as 400,000 years ago, but dog and human fossils date back only about 14,000 years, all of which puts wolves and/or dogs in the company of man or his progenitors before the development of farming and permanent human settlements, at a time when both species survived on what they could scratch out hunting or scavenging.

Why would these competitors cooperate? The answer probably lies in the similar social structure and size of wolf packs and early human clans, the compatibility of their hunting objectives and range, and the willingness of humans to accept into camp the most suppliant wolves, the young or less threatening ones.

Speculators suspect, as Kipling did, that certain wolves or protodogs worked their way close to the fire ring after smelling something good to eat, then into early human gatherings by proving helpful or unthreatening. As packs of 25 or 30 wolves and clans of like-numbered nomadic humans roamed the landscape in tandem, hunting big game, the animals hung around campsites scavenging leftovers, and the humans might have keyed off the wolves, with their superior scenting ability and speed, to locate and track prospective kills. At night wolves with their keen senses could warn humans of danger approaching.

Times might not have been as hard back then as is commonly thought. In many instances food would have been plentiful, predators few, and the boundaries between humans and wildlife porous.

Through those pores and into our hearts slipped smaller or less threatening wolves, which from living in packs where alpha bosses reigned would know the tricks of subservience and could adapt to humans in charge. Puppies in particular would be hard to resist, as they are today. Thus was a union born and a process of domestication begun.

Over the millennia admission of certain wolves and protodogs into human camps and exclusion of larger, more threatening ones led to development of people-friendly breeds distinguishable from wolves by size, shape, coat, ears, and markings. Dogs were generally smaller than wolves, their snouts proportionally reduced. They would assist in the hunt, clean up camp by eating garbage, warn of danger, keep humans warm, and serve as food. Native Americans among others ate puppies, and in some societies it remains accepted practice.

Despite their penchant for misbehavior, and sometimes because of it, dogs keep turning up at important junctures in human history.

By the fourth millennium B.C. Egyptian rock and pottery drawings show hounds hunting with men, driving game into nets. Then, as now, the relationship was not without drawbacks. Feral dogs roamed city streets, stealing food from people returning from market.

Thousands of years later dogs still can be trouble. From 1979 to 1998 more than 300 people in the United States were killed in dog attacks. Most were children. In 1994, the last year data were compiled, an estimated 4.7 million Americans were bitten, 6,000 of them hospitalized. Despite their penchant for misbehavior, and sometimes because of it, dogs keep turning up at all the important junctures in human history.

In ancient Greece, 350 years before Christ, Aristotle described three types of domesticated dogs, including speedy Laconians used by the rich to chase and kill rabbits and deer.

Three hundred years later Roman warriors trained large dogs for battle. The brutes could knock an armed man from his horse and dismember him.

Dogs won few friends in the Dark Ages, when they scavenged corpses of plague victims, but they were much in favor by the second millennium, chasing rabbits and stags for British royalty. In 17th-century England dogs still worked, pulling carts, sleds, and plows, herding livestock or working as turnspits, powering wheels that turned beef and venison roasts over open fires. But working dogs were not much loved and were usually hanged or drowned when they got old.

"Unnecessary" dogs meanwhile gained status among royalty. King James I was said to love his dogs more than his subjects; Charles II was famous for playing with his dog at Council table, and his brother James had dogs at sea in 1682 when his ship was caught in a storm. As sailors drowned, he allegedly cried out, "Save the dogs and Colonel Churchill!"

By the late 19th century the passion for breeding led to creation of private registries to protect prized bloodlines. The Kennel Club was formed in England in 1873, and 11 years later the American Kennel Club (AKC) was founded across the Atlantic. Today the AKC registers 150 breeds, the Kennel Club lists 196, and the Europe-based Fédération Cynologique Internationale recognizes many more. Dog shows sprouted in the mid-1800s when unnecessary dogs began to vastly outnumber working ones, as they do to this day, unless you count companionship as a job.

Which many do. In a recent survey of U.S. dog owners 94 percent listed companionship as a key benefit while only 6 percent hunted with dogs and only 4 percent used them in farming.

People find ways to keep dogs even under the toughest conditions. In New York City almost 100,000 are registered, and officials believe unregistered dogs outnumber those three to one, putting the total at roughly 400,000. Caring for a dog in a city where apartments are tiny, streets and sidewalks are packed, and indoor and outdoor space is scarce is a challenge, but New Yorkers rise to it.

In Central Park regulations that require dogs to be leashed are unenforced from 9 p.m. to 9 a.m., giving dogs and masters a chance to run free on dewy hillsides under tall trees. Patrice Bertin, who restores fine artwork for a living, takes his basenji named Filou (it means "naughty" in French) to a hillside behind the Metropolitan Museum of Art every morning, where Filou runs in a large and astonishingly varied crowd ranging from bird-like miniature Doberman pinschers to towering Great Danes.

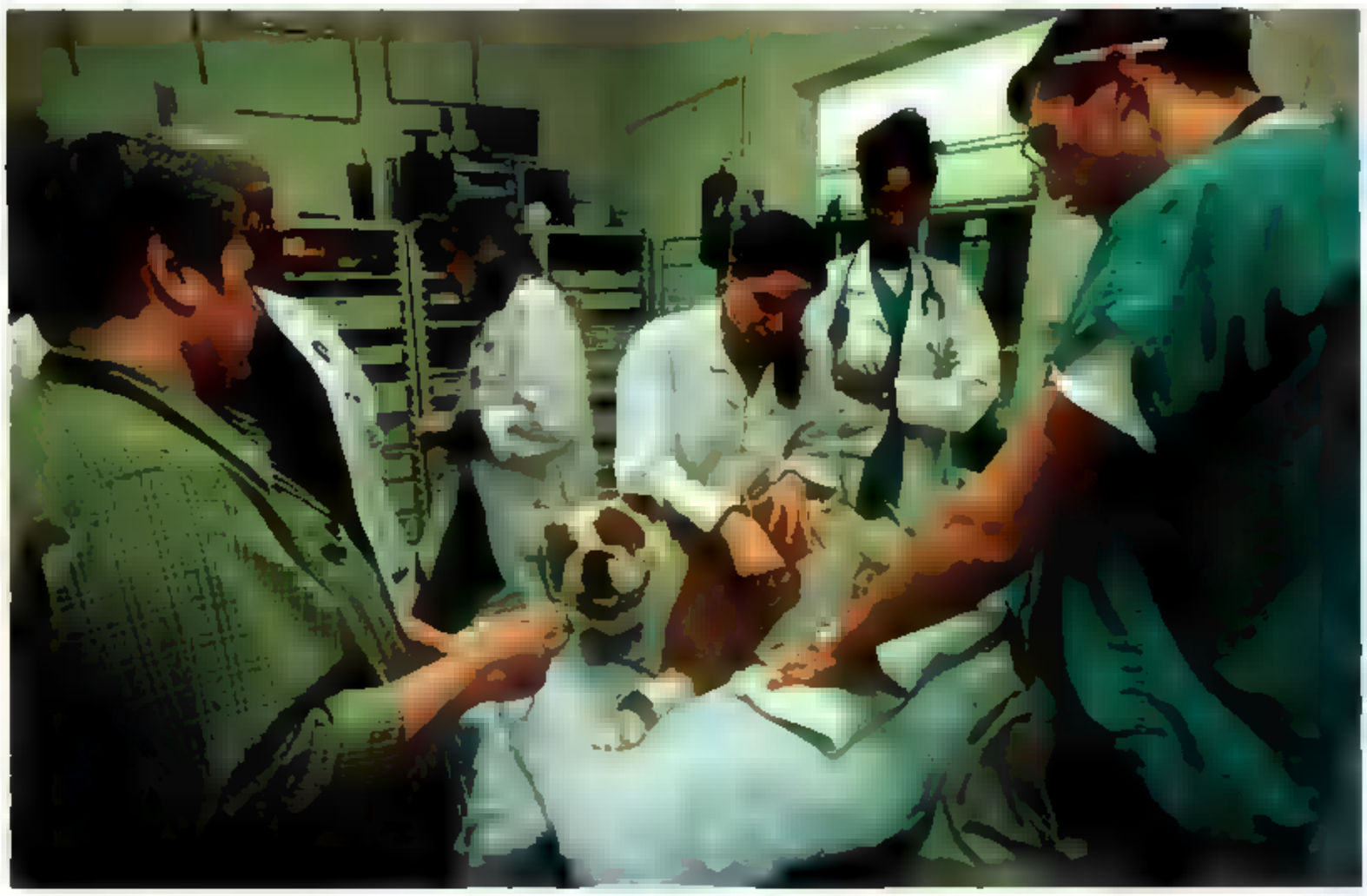
How do you maintain a brace of Great Danes in New York? I shout the query to their owner, running along to keep up with them. "Separate apartment," he shouts back with a crooked grin. "Two saddles!"

Bertin, who likes having Filou underfoot during solitary working days, and his fellow owners chat amiably as the dogs romp. Most are women. "It's our breakfast social club," says Letitia Corcoran, a self-proclaimed "burned-out real estate agent" who once accumulated three dogs and twelve cats in her apartment, all rescued from shelters where they awaited euthanasia. She got in such trouble with her landlord that she was threatened with eviction. "I fought for them!" she says.

Some dog lovers worry that city life and preoccupation with pedigree lead to dogs' being bred for looks rather than talent and to a general decline in their health and usefulness. It may be true, but dogs have not lost their most remarkable natural sense, smell, boosted by as many as 220 million olfactory receptors. (Humans have five to ten million.) My own background is with bird-hunting dogs, which continue to amaze the initiated and uninitiated with their ability to find game or anything else with even the faintest odor.

For reassurance that this skill hasn't been lost, I stop by the tiny town of Goldvein, Virginia, to see Jack Jagoda, co-founder and president of the North American Hunting Retriever Association. His best dog, Elvis, a yellow Labrador, lives in the house and sleeps on the bed, but turn Elvis loose in the field and he is transformed to higher purpose.

Jagoda drives to a hillside behind his kennels and leaves Elvis in the truck while we hike down a rutted track to a wooded creek. We cross it, go up the far bank, and walk to where the creek opens into a pond. Jagoda treks uphill and tosses a plastic training dummy



PRICE OF PERFECTION

A week after giving birth by a C-section—common in big-headed breeds—a bulldog went to Michigan State University's animal emergency service with respiratory trouble, another bulldog complaint. Despite surgery she died. At Crufts, Great Danes look healthy, but inbreeding may predispose them to heart problems.

the shape of a cucumber into a pile of leaves.

We go back and fetch Elvis, who shakes the sleep from his eyes, relieves himself a few times, and comes to heel. Jagoda calms him, points a hand toward the training dummy some 250 yards away. The view is obscured, but when Jagoda barks "Elvis!" the dog is away.

Jagoda whistles him to a stop halfway down the hill, casts him right with a wave to circumvent a brush pile, then stops him at water's edge to reset the course. The Lab plows in, stops midway across to be redirected at an angle that puts him ashore downwind of the dummy. He romps out of the water, never stops to shake, runs by the dummy, comes back on command and catches its scent from several yards away, snuffles it from the shrubs, and races back to turn it over.

A half hour later he's collapsed across my feet in the living room as Jagoda sings his praises. "He doesn't conform to breed standards," says Jagoda. "He's too big." Keepers of pedigree registries "would say that technically he's not even a Lab and shouldn't be bred. Isn't that ridiculous! He's a grand master hunter and makes more money than most people do. I get $500 for stud fee and breed him twice a week!"

Pedigreed also-rans serve other worthy functions. I spent time with Lori O'Heron Rizzo, who lives in the Maryland suburbs outside Washington, D.C., with her husband, two sons, and service dog, Banjo, a black Labrador donated to and trained by the nonprofit Fidos For Freedom. Rizzo, 43, is a freelance graphic

artist whose severe rheumatoid arthritis led to removal of one hip, one knee, and a shoulder. She spent three years on morphine just to cope with the pain but is better now and gets around in an electric wheelchair.

With kids Eric and Patric in school and husband Tony at work, she found home a nerve-racking place. If she fell, she couldn't get up; if she dropped something, she couldn't pick it up. Now gentle Banjo follows her, sleeps at her feet, and rides with her in a specially equipped van. "He does a lot of picking up," she says. "Keys, tissues—whatever I drop. With his harness on I can get myself up and walk, using him for balance. I'm happier with him, more confident, and not so afraid of what's in the future."

OUT AT THE U.S. CUSTOMS training center for drug- and currency-sniffing dogs in Front Royal, Virginia, handlers fine-tune the noses of 85 recruits a year, mostly retrievers rescued from shelters. "Any place you can hide drugs, smugglers will find a way to," says agent Jeff Gabel, a strapping Chicagoan who started working with German shepherds in the Army more than 20 years ago and has been a canine specialist since. "These dogs find drugs inside propane tanks, in false-sided suitcases covered with fiberglass and Bondo, inside the wheels on roller suitcases, in driveshafts and oil pans on cars."

But in these technological times, couldn't

a machine detect the odors? "I'm a dog man," says Gabel. "To say a machine is ever going to catch up to a dog's nose, it's unlikely."

"A machine has to be calibrated, directed at a target," says Carl Newcombe, former director of the center. "A dog responds outside the parameters. He smells it wherever it is and responds. Half the time we're not even in search mode when the dog finds something."

Dogs have been trained to find land mines in war zones, sniff out survivors after earthquakes or bombings, and locate drowning victims underwater. They serve as eyes for the blind, ears for the deaf, and therapeutic companions to the unwell. They can detect signs of an epileptic fit before the sufferer knows it's coming. They find quail, ducks, grouse, and woodcock for sportsmen, and they defend the dwellings of worried urbanites in bad neighborhoods.

They serve as eyes for the blind, ears for the deaf, and therapeutic companions to the unwell.

But truth be told, dogs that work today are a minority, awash in a sea of village scavengers and those that make their way through life just being bits of fluff or bundles of fur to cuddle. Nowhere is that more evident than at the world's biggest dog show, Crufts, in England.

Named for a 19th-century itinerant dog-food salesman and entrepreneur who never owned dogs himself, Crufts drew 20,780 dog entries and some 88,000 people to the 2001 show, which covered 250,000 square feet in five huge halls at the National Exhibition Centre in Birmingham. Far from being a gathering of tony toffs in tweed, it's a convention that crosses every social barrier, with competitors like tattooed, earringed, crew-cut Marc Howard, who came to show Ice, his burly Chinese shar-pei, and proper ladies like Sue Pinkerton of Exeter, who shows Tcheria Hot in the Shade, a towering borzoi descended

GOOD THERAPY Jessie, a specially trained whippet, lets herself be loved while visiting Lucas Parks at the National Institutes of Health. Petting, brushing, and tossing balls helped Lucas keep up his strength during a long hospitalization for an immune disease.

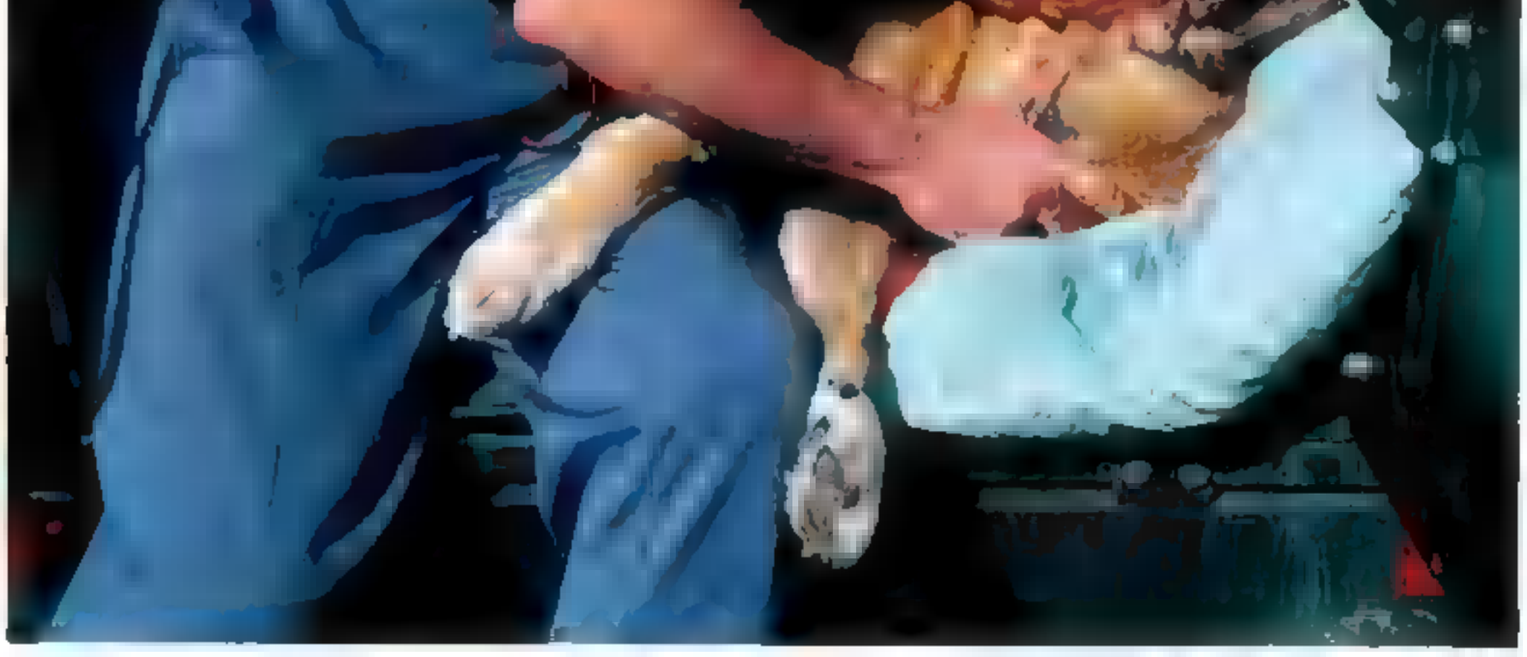
Incredible Journey

When Ed Mulrenin's German shepherd Sonntag became paralyzed in a freak accident in 1998—he injured his spinal cord while chasing a ball—Mulrenin promised the ten-year-old dog that he would not put him down simply because he was a paraplegic. "I stuck by him as he would have me," says Mulrenin, a Washington, D.C., lawyer. Mulrenin tried everything to get Sonntag walking again—surgery, steroids, physical therapy, swimming, acupuncture. He had to massage Sonntag's bladder so the dog could urinate."It was pretty heroic," says veterinarian Jodi Korich.

Mulrenin got Sonntag a canine wheelchair and equipped their lives so that paralysis did not keep Sonntag from doing anything. In

August 2000 he replaced his Land Rover's front passenger seat with a custom-built bed and took the dog on a 42-day, 12,500-mile trip to Prudhoe Bay, Alaska. Upon their return he had planned to take Sonntag to Russia, where Mulrenin had been offered an important position. But Sonntag's health was failing, so he turned the job down. Arthritis set in, and one day last April Sonntag could barely get up. Mulrenin decided to end Sonntag's life, grieving but satisfied that he had not deprived the dog of a moment of pleasure: "I made it to the finish line. I kept my promise."

Undaunted by his dog's paralysis, Ed Mulrenin took Sonntag on a road trip to Alaska. They stopped for walks (left) and camped along the way (above). Later, when pain overcame his dog, Mulrenin decided it was time. As the vet's injection took hold, he whispered in Sonntag's ear: "We made it, buddy, we made it."



PARTNERS IN CRISIS **Looking for the living in the wreckage of the World Trade Center, Labrador Billy and Mike Scott serve in a national search-and-rescue task force. Dogs depend on us; our lives can depend on them.**

from the darlings of Russian royalty.

"It's called competing in breed, but really it's a beauty show," says Caroline Kisko, a Crufts spokesperson who herself keeps 21 Siberian huskies and four German shepherds (she races the huskies from a wagon, sled dog style). "It's good fun, and the dogs love it," she says of Crufts. "Thousands of people are there all day petting them; the dogs go home exhausted because normally they sleep all day."

A roam around Crufts tires the feet as you make your way from showring to showring, navigating a seemingly endless trail of canine merchandise displays leading to green swaths of fake grass where Yorkshire terriers, English sheepdogs, puffy bichons frises, dark Gordon setters, feisty wirehaired dachshunds, rottweilers, hairless Chinese cresteds, and more than 150 other breeds strut and preen for the judges.

The trek starts me wondering how such an array of sizes and shapes, from Chihuahuas you can hold in your hand to hairy mastiffs two men can't budge, could evolve in the relatively short time since domestication began. If human beings mirrored the size range of dogs, the smallest of us might weigh 20 pounds and the largest a ton. How did dogs get so diverse?

Jeff Sampson, a molecular geneticist and the Kennel Club's genetics coordinator, reckons that since dogs have lots of chromosomes (78 to a human's 46), the opportunity to mix and

ANDREA [redacted], [redacted] NEWS PHOTO

match is enhanced. Man has been the great mixer and matcher. "Breeds haven't evolved; breeders have just selected for certain features. In the past 300 or 400 years they could ruthlessly select for features they wanted and very quickly get them," says Sampson.

By way of example he offers the work of a friend, Bruce Cattanach, a fellow geneticist who studies mice professionally but shows boxers for a hobby. "Boxers are supposed to have docked tails," says Sampson, "but veterinarians don't like to do that sort of cosmetic surgery anymore, so Bruce decided to try to breed a tailless boxer."

It didn't take long. To get his wish, Cattanach crossed a boxer with a tailless Welsh corgi, then took the tailless offspring that looked most like a boxer and mated it to other boxers. Eight years and four generations later he had natural tailless boxers in the showring winning competitions.

"The size difference in dogs is more variable than any other species," says Cattanach, "and people since the beginning of time have been working hard to select for certain types—big dogs as guards, speedy dogs for hunting, lapdogs for company. To go from a standard poodle to a toy, it's fairly easily done. But I don't know of any other species you'd want to do it with. I'm sure you couldn't do it with mice."

Such is the remarkable power dog breeders wield. All of which advances the belief that humans really are in charge, which brings us back to the original question: If we're so smart, why do we work so hard while dogs loll around? Could it be that humans aren't the cleverest half of this ageless duet after all?

AFTER OUR LONG CLIMB in the Scottish Highlands, Roddy MacDiarmid and I stop in a pasture in Glen Fyne so he can show off some of the maneuvers with Mirk and Dot that have won him prizes in sheepdog trials, including the Scottish and British national brace championships. He has the sheepdogs round up a small flock of ewes, hector them around a barrel and across obstacles, bring them to us, circle us, and take them away, all with just a toot here and there on his shepherd's whistle. It's quite a show, with the dogs under complete control all the time. Afterward we load Dot and Mirk into the trunk of the car, and I treat MacDiarmid to a soda at the local pub, where he talks glowingly of his exceptional dogs.

Then we part, he to walk around the corner to his house in Cairndow, I to go 35 miles down the road to Colintraive, where I'm staying with friends in a cottage overlooking the Isle of Bute. We're pouring a wee dram of Scotch when the phone rings.

"It's Roddy," says my host. "He needs you."

"Is this Angus?" asks the shepherd, sounding drained and concerned. I answer that it is.

"Would you kindly look in the boot of your car?" he asks sheepishly. "I believe I left my dogs there." □

MORE ON OUR WEBSITE

Search-and-rescue dogs played an important role in the aftermath of September's terrorist attacks: **nationalgeographic.com/ngm/0201.**
AOL Keyword: NatGeoMag

The New

The euro debuts this month as coin of the realm in Europe, a continent

In Flanders fields the poppies still blow, between the crosses, row on row. Amid the flowering meadows around the ancient Flanders town of Ypres there are 170 military cemeteries, with memorial stones recording why soldiers of at least 20 different nationalities died in the World Wars there: "*Morts pour la France*"; "For King and Country"; "*Deutschland muss leben.*" Every evening, the buglers of the Ypres fire brigade gather to play the "Last Post" in honor of the fallen. Every evening people gather to hear it, and many of them cry. The mournful notes rise up into the blue Belgian sky, there to mingle with the spirits of the millions of innocents killed in the hot and cold wars of Europe's bloody 20th century.

But barely an hour's drive across the flat Flanders farmland rises a gleaming memorial to a new Europe in a new century. The relentlessly modern office towers of Brussels' Quartier Léopold house many of the institutions of the European Union, the ambitious effort to create a continent so integrated, so connected, that war will be impossible. Since it began as a coal-and-steel trading arrangement just after World War II, this new concept of Europe has grown dramatically from a Common Market to a Community to the present Union of 15 countries, with 13 more applicant nations eager to join in. The European Union has its own parliament, bill of rights, court system, currency, flag, anthem, and 60,000-member Army (or Rapid Reaction Force, to be precise). It has a 30,000-person bureaucracy and an 80,000-page legal code governing everything from human rights violations and corporate taxation to jam labels and lawn mower safety.

The EU has expanded so far and so fast that academics have been left groping for a term to describe this new political creature. "When you

Europe

striving for political and economic cohesion.

By T. R. Reid
Photographs by Stuart Franklin

get to flags and courts and currency, you're talking about the attributes of a nation-state," says Mark Mazower, a historian of modern Europe at the University of London. "But the EU is not that. It's not going to be a United States of Europe. The most accurate thing you can say is that Europe is engaged in a historical process, built around the principle of cooperation, that is creating some new kind of state."

This month that cooperation has produced one of the biggest unifying steps yet as 12 of the 15 member nations begin using a common currency, the euro, casting their francs, marks, liras, and pesetas into history's trash can.

How much cash does it take to fill the wallets of 307 million people in a dozen different countries? The first minting of euros, to be exchanged for the old currencies over the next two months, totals 50 billion coins and 14.5 billion notes. Just delivering all that money has been one of the great logistical tasks of recent history. Virtually every armored car from Limerick to Lesbos is being pressed into service; some old banks have had to shore up their floorboards to bear the weight of all the coins being exchanged.

But the transfer can't come soon enough for Hans Robert Eisenhauer, a television executive I met at the *fête des Asperges* (that is, the annual asparagus festival) last spring in the charming Alsatian village of Hoerdt, a French town with a German name.

Herr Eisenhauer is a German native who works in France and travels to almost every other European country, as his bulging wallet made clear when he showed me the contents. He fanned out a monetary rainbow of blue, yellow, pink, orange, and green: Belgian francs, French francs, German marks, Russian rubles, Finnish markkas, Spanish pesetas, Dutch guilders, and even a few stray U.S. dollars.

"It is pain to carry it all," he complained. "And you lose always money on the change of currency. But soon most of these bills will be in museum. The one Europe will have one currency."

With all this unifying going on, one of the more delicate issues facing the new Europe is how to create a common foundation without carpeting over the continent's rich tapestry of peoples, languages, cuisines, and cultures. Even Herr Eisenhauer, despite his overstuffed wallet and his commitment to unity, was worried about that. "European culture is a *bouquet de*

"If we can build a single Europe, there

Burnished by the setting sun, gravestones at Ovillers in northern France [illegible] First Battle of the Somme in World War I. [illegible] French, and German forces suffered more than a million casualties between July and [illegible] 1916. The desire to prevent such carnage ever again helped

fleurs," he told me, using one version of a metaphor I've heard all over the continent. "Together they are beautiful. But the rose is still a rose, and the tulip is a tulip. This must be preserved."

The Europeans cherish their differences, even differences that are barely visible to outsiders. "You Americans think Scandinavians are all blond Nordics who love the welfare state," said Mette Kirk, a Danish ethnologist I met on the grand old central square of Copenhagen. "But we see differences, even with our next-door neighbors in Sweden. We have our stereotypes about each other." The standard Danish stereotype, she told me, contrasts jovial, laid-back Danes with efficient but angst-ridden Swedes—a difference crystallized in a popular joke: A Dane and a Swede get together for dinner. The Dane immediately pops open a beer and says, "Let's have a drink." The Swede replies, "Not so fast! I haven't read the list of contents on the label yet."

A key element of diversity is the multipart harmony of different languages heard around the continent, a cultural heritage that today's Europeans are determined to preserve. That determination is enshrined in Regulation No. 1 of the European Union, which says that the official language of each member country will be accepted as a working language in all EU institutions. Since the current 15 members have 11 different official languages, it's a costly commitment. The EU spends well over one million dollars a day to turn one man's *meat* into another's *viande* (or *carne* or *kött* or *liha* or *Fleisch*). The union employs some 4,000 full-time interpreters and translators, not to mention the translating titan called EC-Systran, a software program that can pump out 2,000 pages of translation an hour. Human readers of this magazine may be pleased to know that Systran's stuff usually needs to be corrected by a person before it's usable.

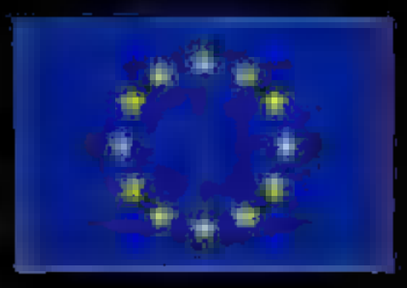
The EU's complex linguistic stew leads to some long days at the office for Marco Benedetti, an Italian who grew up in France, works in Belgium, and smokes tiny Dutch cigars. He's the head of "interpretation"—that is, oral translation—for the European Commission. That means he has to provide simultaneous interpreters in various combinations of the 11 official languages for 300 or more meetings every week. But Signor Benedetti told me that his real headaches come when he looks into the future.

"Under Regulation No. 1 we will accommodate any member's official language. And we have already started our accession campaign to add new members. This means we could be taking in many more languages. Just to think about it, it is possible that we will need people who can interpret from Hungarian to Dutch. From Latvian to Portuguese. From Estonian to—but there are only about a million Estonian speakers in the whole world! And I need about 40 Estonian interpreters!

will not be war anymore. At least, I hope so."

foster creation of the European Union (EU). As an adjunct to NATO forces, the EU is developing a 60,000-member Rapid Reaction Force to respond to crises and act as peacekeepers. Force members raise the EU flag in Strasbourg, France, principal seat of the European Parliament, the EU's legislative assembly.

E Pluribus Unum?



Out of many, one? Some Europeans hope to emulate the American motto and forge a United States of Europe. But what would a united Europe really be like? And what are individual nations willing to give up for unity? There's much frustration over the reams of regulations issued from the EU's headquarters in Brussels. Yet there is also a new sense of European identity as the EU gains economic clout. And because the 15 nations of the EU enjoy prosperity and political freedom, many nations of Eastern Europe are lining up for admission.

1957 FRANCE GERMANY BELGIUM NETHERLANDS LUXEMBOURG

1973 IRELAND UNITED KINGDOM

1995 AUSTRIA FINLAND SWEDEN

1957 ITALY

1981 GREECE

1986 SPAIN PORTUGAL

1995 AUSTRIA FINLAND SWEDEN

NORWAY

NORTHERN IRELAND

Dundee

North Sea

IRELAND

Limerick

Dublin

Sunderland

DENMARK

UNITED KINGDOM

NETHERLANDS

FLANDERS

London

Dover

Amsterdam

English Channel

Sangatte

Brussels

GERMANY

Maastricht

Luxembourg

Frankfurt

BELGIUM

LUXEMBOURG

Mannheim

Paris

Schengen

Hourdt

Strasbourg

ATLANTIC OCEAN

FRANCE

Bern

SWITZ.

LIECH.

Bilbao

San Rocco

PORTUGAL

Andorra

ANDORRA

SAN MARINO

Lisbon

Madrid

SPAIN

MONACO

ITALY

Rome

Seville

Almeria

Mediterranean

MOROCCO

ALGERIA

TUNISIA

MALTA

Valletta

AFRICA


SWEDEN
1995
FINLAND
1973
DENMARK
1995
AUSTRIA
1957
ITALY
1981
GREECE
GDP per capita
(square equals 2,000 U.S. dollars)
Date of entry into EU = pre-EU organization
1957
Country uses euro currency
Export trade
Import trade
Inside EU
Outside EU
(each square equals billion U.S. dollars)
Population density
(people per square kilometer)
More than 100
Less than 2
Applicant country
FINLAND EU member or applicant
Open border
Closed border
Migration
0 mi
0 km
300
NATIONAL GEOGRAPHIC MAPS
LAPLAND
SWEDEN
FINLAND
Oslo
Helsinki
Stockholm
Tallinn
ESTONIA
Baltic Sea
RUSSIA
Riga
LATVIA
Copenhagen
Malmö
LITHUANIA
KALININGRAD (Russia)
Vilnius
Moscow
Minsk
BELARUS
Berlin
Warsaw
POLAND
Prague
EUROPE
CZECH REP.
Vienna
SLOVAKIA
Bratislava
AUSTRIA
Budapest
Ljubljana
HUNGARY
SLOVENIA
Zagreb
CROATIA
BOSN. & HERZG.
Belgrade
Sarajevo
YUGOSLAVIA
Dubrovnik
Tirana
ALBANIA
MACEDONIA
Skopje
BULGARIA
Sofia
GREECE
Lesbos
Athens
Sea
Kiev
UKRAINE
Chişinău
ROMANIA
Bucharest
Black Sea
Ankara
TURKEY
Nicosia
CYPRUS
LEBANON
SYRIA
IRAQ
IRAN
South and East Asia
Caspian Sea
KAZAKHSTAN
GEORGIA
ARMENIA
AZERBAIJAN
AZERBAIJAN
ASIA

"As you know," he went on, sounding rather wistful, "the United Nations has only six official languages. No other international organization would pay the price we do for interpretation and translation. But we're happy to pay it, to preserve cultural diversity." Now Signor Benedetti was getting emotional: "Europe is an orchestra," he said, offering another variant on the familiar metaphor. "But the violins are still violins. We must guarantee that each instrument has its own voice."

One place where every violin has a voice is the European Parliament, with 626 elected members representing the 15 nations. When any MEP (that is, member of the European Parliament) stands up to speak, every word is translated into the other ten official languages, generally in a second or two. The only exceptions to this rule come up on scattered occasions when some member starts speaking in a regional European language like Gaelic or Catalan or Basque, which the interpreters don't translate. The presiding officer generally lets these out-of-bounds orators have their say, even though nobody else in the room may understand a word of it.

An MEP I know from Northern Ireland, John Hume, told me that the linguistic latitude in the chamber reflects the central point of the EU. "The fundamental principle is respect for differences," John said. "The basic idea is that differences are something you live with, not something you fight about."

On a nearly perfect morning last spring, John took me on a tour of Brussels' European quarter and the countless EU offices there. We passed the sun-splashed glass-and-steel headquarters of the European Commission. We saw numerous smaller buildings housing this or that EU operation—so many that John couldn't remember what they all were. Eventually we pulled up to a massive meeting hall, two city blocks long, with the name European Parliament posted over the door in eleven languages. The tour brought home to me how much time, energy, and money has been poured into the EU. I asked if the expenditure could be worth it.

In his lilting Londonderry brogue John launched off into one of his characteristically roundabout answers. "You know," he began, "I've had some experience with conflict resolution." It was a fair statement. John Hume has spent most of his adult life working to end the sectarian warfare that plagues Northern Ireland. He was cursed, threatened, jailed, and firebombed. But he never gave up—and he saw his lifelong dream become a working reality in the Good Friday Agreement of 1998. For this fearless effort to unify his people, John won the Nobel Peace Prize. As the man said, he's had some experience with conflict resolution.

"I see the European Union as the best example of conflict resolution in the world," John went on. "I think every war-torn area in the world should study what the Europeans have done, as I often did in Ireland. Europe decided to leave war and conflict behind. The new rule is, nobody wins and nobody loses. You figure out common objectives, and you work together to achieve them."

Europeans can now drive from the

But conflict resolution is not the only impulse driving the new Europe. There's also a powerful financial motivation: Europe's desire to stand equal with the world's dominant economic power. "If you are Germany or France or the U.K.," says the British historian Norman Davies, "you can't help looking at the American economy and thinking, that's a rather big elephant over there. But if your individual country becomes part of a unified European economy, then you think, Goodness —we could be even bigger."

In the late 1990s Davies himself learned a pleasant lesson about Europeans' growing interest in their own continent. A rather big elephant of his own creation—a comprehensive European history, a 1,365-page text priced at $40—struck a popular chord and became a runaway best-seller. I found this behemoth of

Linking a physical—and psychological—gap, the Øresund Fixed Link connects Copenhagen, Denmark, with Malmö, Sweden, where opening day festivities were held in July 2000. The ten-mile-long span includes traffic lanes and a rail line. It prompted rosy visions of an economic boom in the two-country region. Such regionalism is becoming more prevalent as international borders become less relevant. Yet this raises questions of national identity—of what it now means, for example, to be a Dane or a Swede.

Arctic Circle to the sunny Mediterranean.

Tomorrow's teens + high tech = cell phone saturation at Helsinki's Ressu-saari High School, where phone ownership is near 100 percent. The overall figure for Finland—home of Nokia Mobile Phones—is 75 percent, second highest in the world. European nations hold 9 of the top 11 positions in the world for cell phone penetration. One reason? Unlike the United States, which has several incompatible transmission standards, Europe adopted a single digital standard, permitting callers in all countries to talk with one another.

a book so fascinating that I hated to see it end. So I tracked down the author and asked him, over a pint of bitter in a country pub outside Oxford, to extend his portrait of Europe forward into the 21st century.

"I do the past, not the future," Davies laughed. It became clear, though, that he had thought a lot about the years to come. "The success of the EU is probably one of the big historical questions of the new century," he said. "First there's the basic life-and-death question: Can it really prevent war? But beyond that, this experiment is going to be a central factor in global economics. If the EU can hang together, Europe will once again equal, or maybe surpass, the U.S. in sheer economic power."

In Brussels I talked to another man who has been pondering that idea: Romano Prodi, the president of the European Commission. He's an economics professor by training. As with many European academics these days, a look at his scholarly credentials wouldn't tell you much about his national origins: graduate study at the London School of Economics, visiting professor at Harvard, economist at the Stanford Research Institute. And yet the

minute you encounter Romano Prodi, you just know he's Italian. A charming man with a square face, a colossal smile, and a bushy crew cut, he talks as much with his arms as with his voice, flailing them about for emphasis and waving his glasses in the air when he wants to make a point. The first time I ever met him, Signor Prodi came charging out of his office to find me in the hall and greeted me with a hug as if I were his long-lost brother.

Accordingly, I wasn't surprised at all when the president explained the 21st-century role of the European Union by steering the conversation back to 16th-century Italy. "At the end of the Renaissance," he told me, arms flying, "the Italian states were the leaders of the world in science, arts, weaponry, economics. Leaders of the world! But—but, they did not merge. And they lost their voice in the world. That is the lesson for us today. In the fields where we speak with one voice, Europe shall lead."

For at least six decades—that is, the entire life of most Americans living today—the United States has been the richest place on the planet. But the statistics Signor Prodi spun off for me suggest that a genuinely united Europe would challenge American dominance. Today's 15-member EU has a total population of

with, not something you fight about."

forms spill from a pontoon boat as emigrants from Nigeria and Sierra end a perilous trip from North Africa to 's southern coast. The 10 men and 19 women were promptly intercepted by Spanish civil authorities, given medical treatment, and issued residency permits. Some of the children of such immigrants receive Spanish language instruction from social worker José Manuel near Almería, Spain [below].

Many migrants seek work in the huge greenhouses of southern Spain. inside Spain, some migrants move on undetected to seek out particular ethnic enclaves in other countries. Responding to charges that its immigration laws were too lax, Spain last year tightened its resident-alien standards for migrants.

around 380 million people—about 35 percent more than the U.S. (If all of the 13 current applicants for membership were to join up, the EU population would reach about 550 million.) The combined GDP of the 15 members is about 7.8 trillion dollars, drawing ever closer to America's 9.9 trillion. The EU's annual exports total 857 billion dollars, and its imports come to 938 billion. With those trade volumes the new euro could challenge the U.S. dollar's status as the world's preferred reserve currency.

That kind of economic heft provides considerable clout in global affairs, and Europeans have not been shy about flexing their unified muscles. Just as European companies must adhere to U.S. law to conduct business in America, U.S. companies likewise must comply with EU law to do business in Europe. When two powerful American corporations, General Electric and Honeywell, proposed a merger, the U.S. Department of Justice approved the plan with minor conditions. But the EU's competition commissioner balked—and a 43-billion-dollar deal died aborning. Beyond economics EU members have taken to lecturing Washington on political issues that Americans might think of as domestic matters, such as the death penalty, the U.S. debt to the United Nations, and industrial emissions. "It used to be the Americans who were telling everybody else what to do," Norman Davies told me with a chuckle. "Now the tables are turning."

EUROPE'S INCREASING INTEGRATION is not limited to politics and economics. Following the terrorist attacks in the United States last September 11, EU heads of state agreed on a package of antiterrorism measures, including shared intelligence and a common arrest warrant that would be recognized in all 15 countries. Beyond such governmental initiatives, there are all sorts of transcontinental connections these days that tend to enhance the growing sense among Europe's millions that they all belong to one place.

The most obvious linkage is physical. As Pan-European consciousness has grown, there has been an outpouring of new roads, rail lines, bridges, and tunnels bringing Europeans closer together. A dream of centuries, the Chunnel connecting Britain to the mainland beneath the English Channel opened in 1994. The Scandinavian peninsula was finally joined to the mainland in 2000 by the Øresund Fixed Link—a ten-mile chain of bridge, artificial island, and tunnel across the ice-blue Øresund sound between Malmö, Sweden, and Copenhagen, Denmark. With those connections in place Europeans can now drive from Dundee to Dubrovnik, from the Arctic Circle to the sunny Mediterranean.

No matter where Europeans travel, they like to travel fast. The continent has the world's fastest jetliners (the British-French Concorde),

trains (the French TGV), and highways. I like to drive at speed, but I'm a piker compared with the Europeans. Racing to a meeting in southern Germany last year, I tooled down the smooth, fluid autobahn at 110 miles an hour—and lost count of the number of cars that came up from behind and passed me. Nothing illegal about it either; the speed limit in Germany is whatever you can safely maintain.

European travelers don't even have to slow down at border crossings anymore. Most Western European countries have signed the Schengen Treaty, which eliminates passport and customs controls. If you drive, say, from Stockholm to Seville, you'll go through seven countries and never see a border guard—a boon, no doubt, to many travelers, but a bummer for people like me, who cherish all those visa stamps in the passport.

For my money, the best way to get around Europe is the rail network. And for sheer traveling pleasure, it's hard to match the French national railroad's Train à Grande Vitesse, or "train of great velocity." The sleek bullet-nosed TGVs race from London to the Alps, from the North Sea to the Pyrenees. You zoom along smoothly at 186 miles an hour, sipping a perky young Beaujolais and watching the handsome church steeples of rural France race by outside the window. *C'est magnifique!*

Sadly there is one little flaw in this magnificent mode of travel. Every 30 seconds or so your quiet reveries are interrupted by the bane of European trains, subways, and theaters: the *biddly-biddly-beep* of somebody's cell phone.

The incessant telephonic beeping that plays like tinny background music beneath the rhythms of European life these days is actually evidence of another great Pan-European connection: the GSM network for cellular phones. The handheld phone has caught on around the world, but no place has warmed to the wireless as eagerly as Europe. That's largely due to the GSM standard, which means people can use the same phone without a hitch in any corner of any European country. What the industry calls the "penetration rate"—that is, the percentage of the population owning a mobile phone—is higher in Europe than anywhere else on Earth. In Finland, which in 1998 became the first country to have more mobiles than fixed-line phones, the rate is 75 percent. Virtually every Finn over 14, from the busy Helsinki businesswoman to the reindeer rancher in Lapland, has a mobile phone.

At the Stockmannin Kulma café on Helsinki's handsome central esplanade, I talked telephones one day with some world-class mobile users—students at nearby high schools. "We call the phone a 'handy,'" said Petra Gustafsson, a junior at the famous music school, Sibelius Academy. "And that's a good name, because it is like an extension of your body." The kids told me they make or receive 20 to 30 calls a day, but they use the phones even more

and selling bananas by the pound.

for a new form of communication known as the "txt msg." That's a text message, printed on the phone's small screen, which has the dual virtues of being silent—so you can communicate with your pals during class—and cheaper than voice communication.

The fascination with phones has been a boon for European business; the continent is home to the world's largest maker of cell phones, Finland's Nokia, and the world's largest mobile-operating company, Britain's Vodafone. You might think these companies have been lucky—in the right continent at the right time. But the phone phenomenon has little to do with luck. Europeans' mobile mania is a direct consequence of Europe's quest for unity, as I learned when I visited the big glass structure—more like a greenhouse than an office building—on an inlet of Helsinki bay that serves as the world headquarters of Nokia. I had gone there to visit Yrjö ("It's Finnish for George," he told me) Neuvo, Nokia's chief technology officer, who was one of the original architects of GSM.

As the continent's 40-odd countries move toward tighter and tighter networks, though, there are Europeans who don't value the momentum toward unification. There is outright disdain in some quarters for the legion of Eurocrats in Brussels and their steady output of rules and regulations. In England the struggle between Europhiles and Euroskeptics is now a central element of national politics. That's why a hardworking greengrocer named Steve Thoburn became a national hero.

An intense 36-year-old with curly hair and a gold ring in his right ear, Steve was caught red-handed weighing and selling bananas by the pound at his shop in the old shipbuilding town of Sunderland. This was a violation of EU Directive 80-181-EEC, requiring that fresh produce in any EU country must be sold in metric measures—i.e., liters and kilograms. Thoburn was convicted of this crime in the city court. Britain's national newspapers had a field day with the story—they dubbed Steve the Metric Martyr—and the Euroskeptics adopted him as the poster boy of their cause.

The new euro could challenge the

"In the early days of mobiles, Europe had several different national standards for mobile phones, so you couldn't really use your German phone in the U.K.," Neuvo recalled in his calm, serious way. "Then in 1982 we needed to switch from analog networks to digital. We could easily have done the same thing as the U.S., create several different digital standards, but at that time there was something in the air. This idea of Europeanization was moving forward in many areas: joint research projects, common markets, that sort of thing.

"So we said, 'Yes, let's make one telephone standard for all of Europe.' We called it the Global System for Mobiles, even though it was originally just for one continent. We never expected the penetration rates we have now, but I have no doubt that the single standard is a major reason for it. The ability to connect instantly with anybody—that's what creates value in a network."

Steve's tiny market stall, Thoburn's Fruit & Veg, is a veritable EU of greenery: Dutch leeks, Spanish peppers, French apples, British spinach, and, of course, Brussels sprouts. When I stopped by to see the Metric Martyr, he told me he was thoroughly uncomfortable with that title and with the way his case had been turned into a political football. "I don't give a toss about politics," he said. "I've never cast a vote. I have nothing against metrics. If somebody comes into me premises and says, 'C'mon, love, give us a kilo of bananas,' I'll sell it to her. But nobody ever asks for that." His message for the EU regulators was simple: "Leave a bloke alone so he can give his customers what they want."

I got a noisier and more politicized version of the anti-EU case at a parade of German nationalist parties on a sweltering May Day in Mannheim. Lined up along the Bismarckstrasse were some 200 marchers waving the World War I German flag and carrying large

banners: "German Jobs for Germans First!" "Stop Immigration!" Surrounding this demo was a considerably larger counterdemonstration. Some 600 furious people hurled eggs and mud and horse manure at the marchers, blew whistles and air horns, and roared intermittent chants of "Nazis Out!" Sandwiched between the two hostile groups were a few hundred police in green uniforms, padded like hockey goalies and equipped with shields, riot helmets, and yard-long blackjacks.

Some of the nationalists were classic skinheads, with shaved skulls and T-shirts bearing slogans like "White Power" and "Adolf." I kept a wary distance from them and instead approached a neatly dressed man with a clipboard who looked like he might be in charge. He was Mike Layer, a website programmer who devoted his spare time to organizational work for the local arm of the NPD, Germany's extreme-right, neo-nationalist party. "Don't listen to them," he said to me, pointing a defiant middle finger at the boisterous counterdemonstrators. "We are definitely not Nazis. We are marching for the German working-

A bid for the luxury market paid off for A. Lange & Söhne, whose watches start at $9,000. Closed during the Cold War, the firm reopened its plant in the former East Germany in 1994, crafting watches for which customers wait up to two years. The waiting list is also long for an Aston Martin, favored vehicle of Prince Charles—and James Bond. The company's two plants in England make only 1,500 cars a year. Such boutique firms help fuel the economy of Europe, whose gross domestic product now approaches that of the United States. French President Jacques Chirac declared: "The European Union is today the top economic and commercial power in the world." An exaggeration perhaps, but maybe not for long.

U.S. dollar's status.

man. There are four million Germans unemployed, and we don't want people from Turkey coming here, from Iraq, taking jobs away from Germans. That is the problem with the EU. It is for borderless Europe. But nations need borders. Nations need their own currency. We want Germany out of EU, out of NATO, and free to make its own choices."

While some people want to get out of the European Union, there are many on the outside pushing to get in. Currently there are 12 formal applicant countries on the waiting list, plus Turkey, which has a special status because it has not yet convinced the EU that it meets the required human rights standards. Most of the applicant nations spent half a century on the communist side of the Iron Curtain; they see EU membership as a key step in their transition to free government and free markets.

The transformation is already manifest in Estonia, a green, flat land of lakes and forests

just across the Baltic from Finland. Barely a decade ago it was a neglected Soviet province that sent timber, taxes, and military draftees to Moscow, receiving little in return. Today, the 1.4 million Estonians have embraced capitalism so eagerly that the streets of Tallinn, the capital, are lit up all night long with the neon portals of a dozen casinos.

I ventured inside the Casino Victoria on Lauteri Street, a lavish red-carpeted palace of a place with Monaco-style baccarat dealers in tuxedos and Vegas-style waitresses in sequined minis and fishnet stockings. The croupiers spoke Estonian, Russian, Finnish, and German; my luck proved rotten in every language, and I lost a pile of the nation's currency, Estonian kroons, at the roulette table.

The next morning, poorer but wiser, I met an Estonian whose career has blossomed along with the country. Toomas Luman graduated with a civil engineering degree from Tallinn Technical University in 1982, served his required stint in the Soviet Army, and went to work in a drab concrete building that housed the state-owned building materials monopoly. Today, as chairman of the board of EE Grupp, the biggest Estonian construction company, he sits behind a huge cherry desk in a modern office complex that would look perfectly at home in Bern or Berlin; while I was talking to him, he wandered over to his Compaq laptop to check the latest prices on the Tallinn Stock Exchange.

I asked Mr. Luman if he had ever thought, during his Soviet school days, that he might end up as chairman of a corporation. "I might have dreamed to be head of a company," he said. "But not of a private company. Nobody thought then that we would have private companies in Estonia. We were communist! The changes in ten years have been tremendous."

One more change that Estonia absolutely needs, he went on, is membership in both the EU and NATO. "We are not Switzerland here," he told me. "For us it is a geopolitical fact that Russia is on our eastern border, is two hours' drive from this building. We don't know what Russia has in mind, so we need NATO. We do know that our markets now are almost all in the EU, so we need to be a member."

In addition to the residents of the applicant countries, there is another hardy breed of people who are anxious, indeed desperate, to get in. In the past ten years or so a mighty wave of immigration has washed over Western Europe bringing millions of refugees from Eastern Europe, from North Africa, from Central Asia, and even China. The lucky ones get entry visas; they stash all their belongings in a car and drive west. But most pay human smugglers for a clandestine place in a rowboat or a rubber raft, a car trunk or a tomato truck. Those with no money leap from overpasses onto moving trains or curl up in the wheel wells of airplanes, frequently with deadly results.

"The success of the EU is . . . one of the

Harmony reigns as Ukrainian singer [illegible] bajlo directs Eastern Orthodox hymns in Poland, a nation that is primarily [illegible]. Bringing harmony to Europe's many ethnic and religious groups is a prime EU goal. The 13 additional nations now seeking membership are placing increased emphasis on tolerance.

The immigrants—some two million legal and an estimated 500,000 illegal each year—are drawn by Europe's prosperity and by the basic human rights that all EU nations guarantee. Since many of the refugees know some English, Britain tends to be a popular destination. That explains why more than a thousand people every month knock on the door of a massive corrugated-metal warehouse on a hillside in Sangatte, France, just outside the port of Calais. By day the migrants live at the refugee center the Red Cross operates in the warehouse. By night they search for a trucker or ferry captain who will secrete them across the English Channel.

From that French hilltop the immigrants can see the white cliffs of Dover beckoning them on the horizon. Among those staring westward one Sunday morning last spring was Ali Farooq, a father of three from Kabul who had a silvery gray beard and a badly wrinkled yellow sweater.

"A few months ago," he told me in a voice etched with sadness, "my brother was disappeared by the Taliban. Someone warned me: They were coming next for me. I found a *qachaqbar* [a smuggler] and paid him $500, American money. Early in the morning, in darkness, I got in a truck with beans and plums, and we left Afghanistan. I rode two and a half months; many trucks, one boat. I have $430 left, American money, and I am looking now for a qachaqbar to get me to England. There I hope to find work. I hope to find peace."

I gave Mr. Farooq my phone number months ago, when I met him, and asked him to call me when he arrived in London. I haven't heard from him yet. Still, I'm assuming the best: He has a new home now in Europe, and he has found peace. Because the new Europe, with its countless interconnections, is all about peace. I was reminded of that when I was visiting those heartbreaking cemeteries in Flanders fields and ran into a chipper 78-year-old war veteran named Guy Bracq.

A natty, white-haired Belgian in a blue blazer with a red silk handkerchief poking up from the pocket, Mr. Bracq told me that his father had fought in two battles at Ypres in World War I. In World War II it was his turn; he entered the Belgian resistance, was jailed by the Nazis, and freed after the Allied landings on D Day. Then he joined a British Army artillery unit to help drive the enemy from his homeland. But all that, he said, "is only history."

"For centuries people have been trying to build one Europe," he told me. "Napoleon tried to build a Europe, through force. Hitler tried it, through force. Now it is up to us—and we are doing it this time by our own choice. If we can build a single Europe, there will not be war anymore. At least, I hope so." □

MORE ON OUR [illegible]

T. R. Reid ■ tour guide on ■ multimedia journey through the new Europe ■ **nationalgeographic.com/ngm/0201.**
AOL Keyword: NatGeoMag

big historical questions of the new century."

At the Court of Human Rights in Strasbourg (right), Gypsy children stroll the grounds as their elders seek legal protection from persecution in Hungary. The court ruled the families must first exhaust all [illegible] remedies in Hungary, intimating that the new [illegible] will be reckoning with the [illegible] for a long time to [illegible]

BY TOM O'NEILL WEBSTER

Photographs by GEORGE F. STEINMETZ

CHINA'S UNKNOWN GOBI

ALASHAN

Like the storm surge of a primeval ocean, dunes
a thousand feet tall roll across northern China's Alashan
Plateau. Salty springs, red lakes and this corner of the Gobi
like colored sands. Once ignored, such natural
deserts now help scientists understand—even restore—
the barren landscapes created by human
exploitation of fragile soils and scarce water resources.

. . . an aging population still living a tradition that stretches back to before Genghis Khan.

Walls of sand and a Buddhist monastery flank a lake in the Badain Jaran, one of several deserts in the Alashan. People here rely on camels for transportation and goats for meat and wool. Telegraph service arrived 20 years ago, but daily life would likely be familiar to the Mongol herdsmen who dwelled here centuries ago.

Buddhist prayers rise among bright banners and pillars bearing Mongolian script. The Erdene Juu'n monastery once housed 60 monks. Now only one, Sengmatin, remains to serve a dwindling, and aging, population.

GHOSTS LIVE HERE. That's what the Chinese say. They claim this place, a walled fortress abandoned in the 14th century and called Khara Khoto—Black City—is inhabited by demons and spirits.

I understand why. Around me Khara Khoto is a haunting pile of drifted sand that partly covers its 30-foot ramparts (pages 62-3). Inside the city's walls lie ruins of a once vital kingdom. All that remains is shattered and tawny mud buildings crumbled long ago, scatterings of bleached bones unidentifiable with age, and smashed crockery pots and bowls. Granite millstones—their three-foot faces etched by lines seven centuries old—also sit half-buried in the sand.

In the slanting light of an October sunset the legend of the Black City's violent and bloody end spreads across the sand around me. The year was 1372, and the Mongol king Khara Bator—his people protected inside these walls, which were taken by Genghis Khan's Golden Horde in 1226—was witnessing the end of Mongolia's reign across Asia. Outside, the armies of China's ascendant Ming dynasty were massing, and they'd employed the surrounding desert as their deadliest weapon. Diverting the Black River, the city's water source that flowed just outside the fortress, the Chinese denied Khara Khoto moisture for its gardens and wells. Then they simply waited.

As the Black City's thirst grew deadly, Khara Bator recognized his fate. Insane with fury, he murdered his family—then turned his sword upon himself. After his suicide Khara Bator's soldiers vainly continued inside Khara Khoto's fortress, weakening beneath the sun. When the Ming finally attacked, they slaughtered the remaining Mongols like livestock, leaving bodies unburied, the garrison sacked, and a stain of murder so dense on the sand it spawned the ghosts of today.

Walking from the walled city's center, I climb a sand dune inside Khara Khoto's fortifications to stand on the rampart's top. To the west the sun is touching the horizon. The day's tourists have gone, fearful of the ghosts and the hour-long drive across this rugged desert to the hotels of town.

Me? I'm staying.

In the night I'll walk the city's 12-foot-thick outer walls—as much as 450 yards to a side—and doze beneath the stars. I'll listen to the stories of Wang Zegong, the 70-year-old guard at Khara Khoto, who sleeps in a canvas tent outside these walls every night from April to December. He's witnessed the ghosts' doings: the fuel-less flames that burn for hours and rise ten feet into the night sky, the roving pool of light that arrives after midnight and that once led him miles into the desert, left him for lost, then—when he called out for help—returned and guided him back to his camp through the darkness.

"My favorite story is this," he tells me over a bowl of instant noodles. "One night I heard two logs colliding, again and again, outside my tent. *Bang! Bang! Bang!* So I got up, went outside, and there were two big firewood logs lying near each other on the sand, exactly where the noise had been coming from. They were logs from my firewood pile,

Casting long double-humped shadows, Bactrian camels wind back to camp after foraging among Badain Jaran dunes for their evening meal. Able to carry 500-pound loads with [redacted] and go for days without water, these surefooted natives helped writer Donovan Webster and photographer George Steinmetz explore parts of these vast sand seas rarely seen by Westerners.

which is on the other side of my tent. I had not moved them. They had not been there when I went to sleep—but they were there now."

If there are ghosts here, I want to know them. During my travels I've encountered many things on the verge of being haunted: institutions and ways of life being abandoned by a China equally reverential of its past and hungry for its future. But actual ghosts?

So after dinner with Wang Zegong, I grab my headlamp and return inside Khara Khoto's walls. There I sit and wait for ghosts. Above me in the darkness, the bright pinprick of Venus slips toward the western horizon as constellations emerge. During the night a cold October wind rises to whip the corners of the ruins. But the ghosts never come. It is only me, sitting inside the ancient walls of a ruined city in the dark, pondering mankind's endless dance across these sands with time, events, and rain.

Living alone in a mud-brick house, Diudiu tends a mirrored solar collector she uses to boil water for tea and rice. A reed fence protects her yard from goats and blowing sand. Sandstorms roaring out of China's deserts, which cover half a million square miles, blast tons of grit eastward, closing airports as far away as Beijing.

THE GOBI isn't the world's largest desert (that's the Sahara) or its driest (the Atacama) or its most dramatically diverse with life (the Namib). Instead, it is Earth's northernmost desert and the least populated environment outside the polar caps. And it possesses a record of human habitation that is among the longest on Earth. Straddling the boundaries of China and Mongolia, and at 500,000 square miles nearly twice the size of Texas, the Gobi is a place where often less than three inches of rain falls a year. In fact Gobi is a Mongolian word that means "waterless place." Geologists have tagged the word with a slightly more specific meaning. To them the word Gobi is shorthand for "gravel desert." And at this rocky, gale-scoured desert's heart, in the reaches of northern China, is the Alashan Plateau, a place so remote and sparsely inhabited it has scarcely figured in China's long history. Today it remains rarely visited owing to its status as a missile-testing zone for the Chinese military.

In September and October of 2000—thanks to the goodwill of the

"I don't understand the outside world. I know only eating, drinking, tending animals."

Chinese Academy of Sciences and its Institute of Desert Research in Lanzhou—photographer George Steinmetz and I were given unprecedented access to the Alashan. During eight weeks of exploring by camel, on foot, by rail, and by road, we looked for human traces on the desert's surface. The Gobi expands and contracts, allowing people to press civilization inside during its wetter intervals, only to be driven out when the desert expands once again. Throughout these cycles, however, resourceful Mongol herdsmen, the descendants of Genghis Khan, have clung to the hard earth. To better understand the remnants of Mongol culture inside China was one of our aims. Today the desert is spreading, and for China's 1.26 billion people this is one of their gravest problems, so we also wanted to learn from the Alashan how the entire Gobi steals thousands of acres of farmland every year.

But as we begin, we're aiming beyond the Alashan's edges into its center. There, we've been told, we'll find the world's largest dunes: sand mountains that often top 1,200 vertical feet. Many are separated by valleys holding spring-fed lakes. This 17,000-square-mile zone of megadunes—the Badain Jaran, sometimes called the Miraculous Lakes—is unique in the world. Only one other Western group has ventured inside in modern memory, a 1995 expedition led by the German geologists Dieter Jäkel and Jürgen Hofmann.

After a week of travel by aircraft and four-wheel drive, we arrive at the end-of-the-road town of Yabrai Yanchang to collect our string of 20 two-humped Bactrian camels and five horses. "Where we are going, we will need these camels," says our guide, Yue Jirigele, with a smile that reveals a gold-capped front tooth. Yue, 46, is a sturdy six feet tall, with a tanned and wind-creased face. He is a Mongol herdsman and the area's former mayor. He asks us to use his familiar name, Lao Ji. He shares some sweet, hard bread with us and says he lives amid the big dunes about 20 miles away. He has five children, ages [redacted] to 22.

Like all children attaining primary-school age in this isolated place,

A paraglider flies over a lake dyed garnet by salt-loving bacteria that flourish in its hypersaline water. Evaporation outpaces the flow of fresh water springs (blue-green arrows), thus concentrating salts.

they spend the academic year at boarding schools outside the Badain Jaran and return home each summer. The best students among them are then allowed to continue beyond a government-mandated ninth grade to higher learning outside the Gobi. Lao Ji's oldest daughter, he's proud to add, is in college in Beijing—studying English.

Did he himself leave the dunes to study? I ask as we walk.

"No," Lao Ji says. "The new education policies in this part of China started with my children's generation. I was schooled at home—in the *ger* [Mongolian for yurt]—but not enough. I think it's good my children are being educated. My wife and I miss them, but education is the future. . . ." He gestures toward his pack animals. "Not this."

For two days we press on, leading our loaded camels into yellow dunes that slowly—imperceptibly almost—rise taller. We camp near a few of the spring lakes, their water made salty by chlorides leached from the sand and left in high concentrations by evaporation. By the third day—carrying a canteen of water taken from beyond the Badain Jaran's edge—I've trudged up and down several steep dune passes that rise 800 to 1,000 feet. Sand is never easy walking, and climbing each dune's pitched face is exhausting. Sweat stings my eyes and soaks my shirt. Then, standing atop a dune on our third day, I turn to stare back at our progress and discover we've entered a vast sand mountainscape. Like a treeless Tirol, the sand mountains are draped in a dozen shades of saturated yellow beneath a clear blue sky.

Standing in the pass with me is Dong Zhibao, one of two Ph.D.'s on the expedition from the Institute of Desert Research. A friendly, lighthearted geomorphologist of 35, he plans to study these 1,200-foot dunes and publish a paper on his findings. "What we are seeing here, these megadunes," Dong says, "is the result of very specific factors. Things that could only happen here."

Dong reaches down and lifts a handful of clean yellow sand. "These sand grains are coarse and very uniform in size," he continues. "This allows spaces to be created between them, spaces capable of trapping drops of water, which allows plants to grow."

Over time, as the plant roots stabilize the sand, each plant helps fix the dune, while blown sand and newer dunes roll over the tops of existing megadunes. These new dunes are then held in place by the plants beneath, and revegetation begins on the new top layer.

Like a bed thick with quilts of Velcro, the megadunes have seen successive fresh covers for millions of years. "At the interior of each megadune," says Dong, "you may have a dune 4 to 40 million years old—though a precise age has yet to be determined. But no matter how old the base of a megadune is, its top layer, its newest feature, may be only one year old. It's a complex process. Layer on layer on layer, requiring time and the area's characteristic mix of sand and rain."

"Like Khara Khoto we will be destroyed after being weakened by thirst."

ON THE AFTERNOON of our third day we crest the top of another megadune pass, and below us sits a bowl-shaped valley. At the valley's northern end, fringed in rich green grasses and reeds, there's a small lake so saturated with salt-loving bacteria that its color is glittering vermilion. Sheep and goats drift across the dune hillsides, eating the sagebrush-like artemisia that grows on them. Camels and a few horses graze near the lakeshore. And at the far end of the lake, all alone, sits a pair of small square blockhouses.

A thousand years ago Khara Khoto's quarter-mile-long walls proclaimed its power and prosperity. Conquered by successive waves of Mongol and Chinese warlords, the city finally perished when the Black River's course shifted—or was diverted, as legend has it—cutting off the water supply.

We trudge down the dune, surprising the lady who lives in the valley. Her name, Lao Ji tells us, is Diudiu, and she's 72. She was born to a semi-nomadic Mongolian family near here. She never had children, and her husband died in 1974, leaving her as the last of her family.

With the same hospitality we'll find across the entire Badain Jaran, Diudiu sets up for visitors. She goes inside her house and fills a tea-kettle with water from a small cistern, then walks outside to a mirrored solar collector the size of a TV satellite dish. At the dish's center, where the rays of the sun will be focused, Diudiu snaps the kettle into an iron fitting, then she pivots the dish to face the afternoon sun. In seconds the kettle is smoking. Within three minutes, the water is boiling furiously. "I sold hair from my camels and sheep to buy this on the outside," she says, turning the mirrored face of the dish from the sun to retrieve the kettle. "It keeps me from having fire going all day."

Diudiu invites me inside her house. A wide earthen platform for sleeping and sitting occupies the back wall. The other walls are lined with wooden pantries and lockers; the boxes hold bags of rice and dried meat, a few potatoes and wild onions in baskets, and some extra

Producing heaps of cotton and herds of goats may soon exhaust the fertility of land along the Black River. Intensive cultivation, grazing, and water use are accelerating the desertification of such marginal areas, says Wang Tao of China's Institute of Desert Research. "It's one of our most serious environmental problems."

clothes. In a corner a stack of folded blankets waits for winter. There's a small hole in the roof for the chimney of Diudiu's potbellied Mongolian stove, which is now outdoors for summer cooking.

She sprinkles dried tea into the kettle's hot water, then pulls out drinking bowls and a bowl of rock sugar. "Come and drink," she says, motioning for me to sit.

Diudiu is four feet tall and dressed in modern China's standard outfit: loose trousers and a button-front jacket, both of blue cotton. Her black hair is covered with a bandanna, her dark eyes sharp and quick. She has a wide Mongolian face—broad planes of cheekbones—which has weathered into a map of wrinkles.

I gesture toward a cliff swallow's nest that clings to the interior front wall, above the door. Diudiu smiles. "I like birds in the house," she says. "They're good company."

Spending the next few days with Diudiu, I will see that she possesses everything she needs. Though winter can get cold, as cold as minus 30° Fahrenheit, she is prepared and experienced against it. Outside the house there's a sheep and goat pen whose four-foot-tall walls are made of camel dung wetted and pressed into bricks. In winter these bricks, which burn hot, warm her house and provide cooking fire. She also eats four or five sheep each winter, deep-freezing what she doesn't need by hanging the butchered carcass in a shady spot outdoors.

Following an hour or so of visiting, Diudiu goes outside. She fires up her stove and boils a pot of rice. In a wok she stir-fries potatoes and wild onions. Then she walks into her house, opens one of two large ceramic cisterns, and dips an eight-ounce plastic water bottle inside. "Rice wine," she says. "Have some?"

Diudiu produces some thimble-size glasses and pours the wine. Luckily the cups are small, since the wine is powerful and goes down like kerosene. One of these cisterns, she says, is fully fermented. The other is in the process of fermenting, so there's always a supply of

wine. "I drink one of these bottles a day," she says. "It's my recreation."

Slipping back outside, Diudiu checks the rice. Night is starting to fall. The first stars peek out. She lifts the food, carrying it inside the house to her small table. "See? I have everything," she says. "I don't understand the outside world. I know only eating, drinking, tending animals. This is what my parents did. Their parents. The young people today, once they leave the Badain Jaran, they never return. I don't blame them. The old life of herding is coming to an end. Work in cities is the future. But for me, I will live in this place until I die."

The youth of the Alashan, it appears, never return home after going off to school.

DURING TWO WEEKS in the Badain Jaran, I will meet several solitary men and women—most are 60- to 70-year-old herders—an aging population still living a tradition that stretches back to a time before Genghis Khan. But I also pass as many abandoned encampments as occupied ones. During my visit, in fact, I will find only two people younger than Lao Ji's 46 years. One, a government official and radio operator at a small outpost near the desert's remote center, is 36 years old; he talks longingly of leaving, the way a man dying of thirst speaks of water. The other young person, a three-year-old child, the afterthought of a middle-aged herding family, is still too young to be sent away to school "outside." Other than that, the youth of the Alashan, it appears, never return home after going off to school. Everyone I speak with agrees: The future is not among these unforgiving dunes and valleys.

But as the people of the Badain Jaran work and dream of escaping the desert, Chinese scientists are puzzling out how to stanch the desert's steady growth. According to the Institute of Desert Research, land degradation costs the nation 6.7 billion dollars a year and affects the lives of 400 million people. Current estimates say that 950 square miles of land becomes desert every year—a 58 percent increase since the 1950s—much of it land that formerly supported crops and livestock.

Megadunes loom over farms near Dunhuang. Their cores are stable, but windblown surface deposits can advance six feet a year. Bands of pines and poplars form a surprisingly effective shield against encroaching sands.

In a nation of more than a billion people, all of whom have adequate amounts of food but many of whom need better nutrition, such enormous losses are potentially devastating.

"Most desertification is due to increasing human population," says Wang Tao, acting director of the institute. "Increasing the number of people in an area places incremental pressure on land through farming, construction, roadbuilding, and other human activity. Add to this increasing water use and slight fluctuations in larger weather systems, and depletion of soil nutrients and desertification quickly become problems demanding great consideration."

Since 1956, beyond their laboratories and offices in Lanzhou, the institute has operated a research station a half day's drive away in the little town of Shapotou, along the Yellow River and about 250 miles southeast of the Badain Jaran dunes. At the research station scientists and visiting colleagues experiment with different ways to stem drying and erosion by wind and water. They also develop new crops suitable for the desert, look into ways to preserve soil richness in China and beyond, and use a wind tunnel and banks of optical-scanning computers to study the movement of blown sand.

A few days after we emerge from the dunes of the Badain Jaran—saying a sad good-bye to Lao Ji and his camel train—I visit the station with the geomorphologist Dong Zhibao. The station itself covers more than a square mile on the side of a steeply pitched dune that traces the Yellow River's northern bank. Today the station is a tilting garden plot in what must be one of the world's most dramatic locations. To our southwest, across the river, the rocky peaks of the Tibetan Plateau jut into a cloudless sky; and just beyond the northern edge of the complex, separated by a railroad line bordered with vegetation, spread the dunes of the Tengger Desert, another district of the Alashan.

In Chinese, *shapotou* means "steep dune slope." And initially, Dong says, the research station was placed here on a temporary basis to study the desert's dangerous relationship with the railroad. Dunes would blow across the tracks, halting trains and interrupting commerce. Within weeks, though, scientists had conjured an inexpensive remedy. They arranged grids of straw in roughly one-by-one-yard checkerboards along the rail lines; then they drove the straw into the sand, leaving the stalks standing four to six inches above the ground, which created a low windbreak. This slows blown sand grains at the rail tracks, allowing plants to gain a foothold and fix the dunes.

Dunes would blow across the tracks, halting trains and interrupting commerce.

OWING TO ITS SUCCESS at halting the desert here, the Chinese government decided to make the temporary base a permanent post. Since then the research station has forged partnerships with the United Nations and countries as disparate as Japan and Israel to explore erosion and desertification. Inside the labs, greenhouses, garden plots, and erosion test zones, 19 full-time personnel and a phalanx of visiting scientists push desert study forward. "We do a lot here," says Dong as we walk past greenhouses growing new hybrid strains of arid-soil melons. Ahead is a mile-long "reintroduction garden," where the station tests varieties of trees, shrubs, and annual grasses for desert suitability.

Dong pauses to touch the leaves of a ten-foot-tall European poplar. "Vegetation is probably the best and least expensive way of controlling

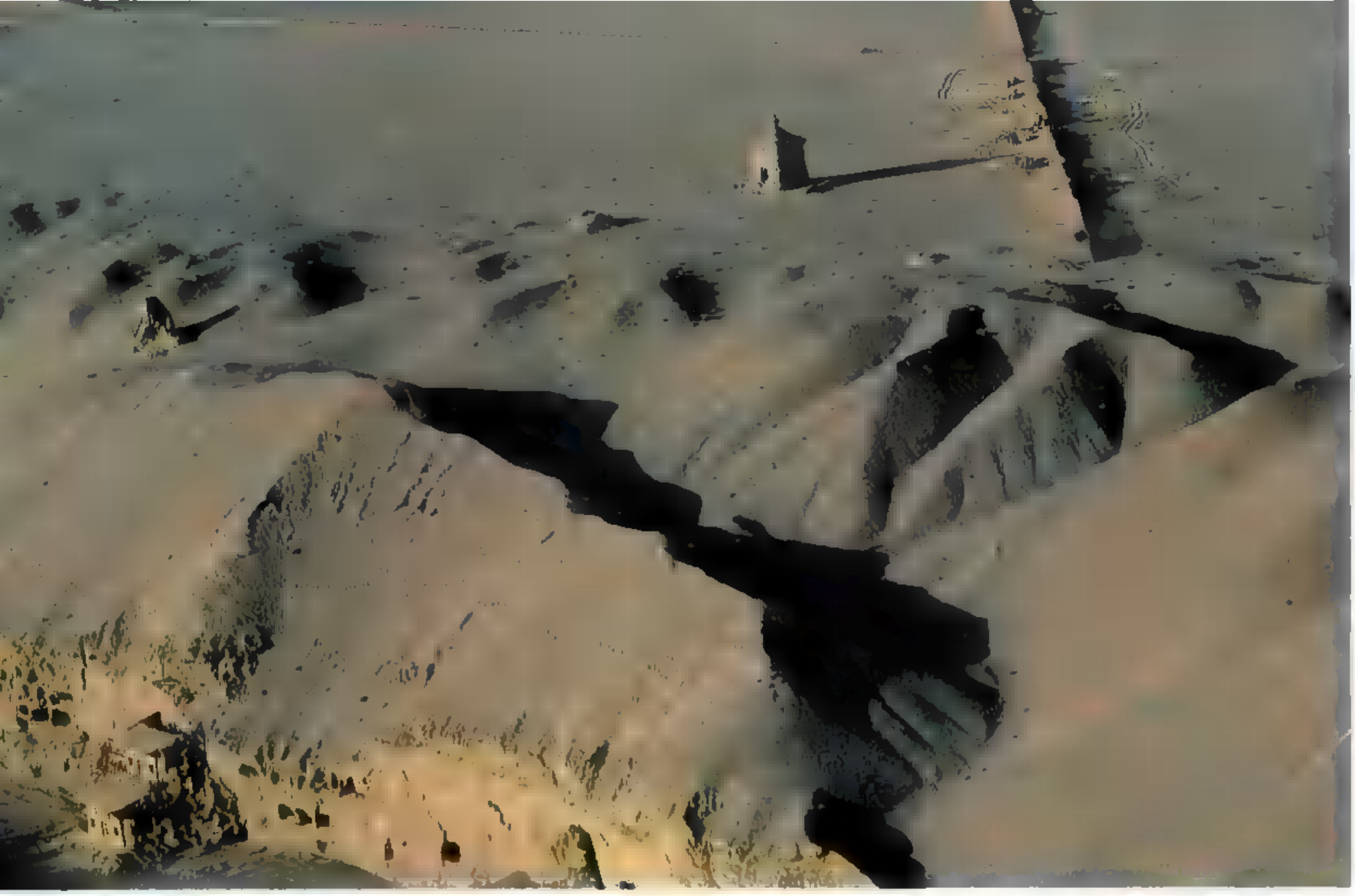
Inspecting tracks near Jartai, rail workers pedal through the Mu Us Desert. Chinese researchers developed a simple technique to shield railroads from hazardous drifts: Grids of straw slow surface sand movement, allowing plants to establish themselves and stabilize surrounding dunes.

dune movement and wind erosion," he says. "But you have to find out which plants can survive in which environments. Take these poplars. They're resistant to wind, salty soils, and salty groundwater. That makes them very suitable for deserts and windbreaks."

Despite the garden's being initially set on sandy desert, the soil is now loamy dirt: a result of using silty Yellow River water for irrigation. The water may sink into the earth or evaporate, but the silt has stayed behind.

"This place is proof you can make a desert bloom," Dong remarks. "But we are careful, making sure we test and approve many different varieties of plants and grasses. If you only OK a few species for use, you're vulnerable to blights or parasites that could destroy everything again and return useful land to desert. Plant biodiversity is insurance against that."

We keep walking. A robust vineyard and orchard blanket a hillside within the station's brick walls. To the west are experimental rice fields. "Growing rice in the desert isn't advised, too wasteful in water," says Dong. On some sandy black hillsides they are testing new



Caves filled with sacred Buddhist murals and sculpture honeycomb a cliff (above) near Dunhuang. Monks and pilgrims created this series of nearly 500 caves over a millennium; today 200,000 tourists visit yearly (facing page). Conservation teams have planted windbreaks above the cliff to reduce the volume of damaging sand blown onto the site.

petroleum-based sprays for sand fixing. "It's still too expensive for general application," he says. "And not very environmentally sound."

Ahead, inside a steel fence topped by barbed wire, is the station's Drip Irrigation Center. A joint Chinese-Israeli project, it has developed a stingy, drop-by-drop irrigation system using hoses punctured with tiny holes every few feet to irrigate desert-friendly fruits and vegetables.

As we step through the gate, the center's curator, Zhao Jinlong—a sixtyish man wearing dusty gardener's clothes—meets us. While the other gardens seemed lush, they are paled by the fruits and vegetables inside this fence: watermelons, apples, green onions, cucumbers, corn, hot peppers, honeydews, bell peppers, radishes, carrots, cabbage, soybeans, pears, tomatoes, squash, spinach, cilantro.

"I turn on the irrigation three and a half hours a day," Zhao says. "And by planting seeds just beneath the perforations in these hoses, we save 90 percent of water used each day. Usual irrigation, with canals and ditches, is very inefficient. Evaporation. Runoff. A large percentage of irrigation water never reaches where it is directed." The center's drip system uses 800 gallons a day, a saving of roughly 7,200 gallons. Conventional irrigation, Zhao says, also makes land prone to erosion. "So though it requires larger initial investments, drip irrigation is clearly a much less expensive way to farm for the long term."

Dong reaches down and plucks a few tomatoes from a nearby bush. He hands me one. It is wet and saturated with tomato taste, far tastier and meatier than tomatoes I buy in the United States. "Because drip irrigation is so consistent, the quality of produce is very high," he says. "Over time, look for these techniques to be implemented in China's arid regions and beyond."

Dong steps away, popping some ripe apples from a drip-irrigated tree. "Here," he says, handing me a large, red, shiny apple as I finish the tomato. "You are eating the future."

TO SEE WHAT MAY BE China's most desertified place, Steinmetz and I head north to the desiccated city of Ejin Qi, hard against the Mongolian border and near the shores of two dry lakes. According to Dong and Qiao Maoyuan, director of water resources for Ejin Qi, about 1.5 inches of precipitation falls on the area each year, while evaporation occurs at a rate of about 150 inches a year. "So as you can see," says Dong, "this area of the desert has significant water-related problems."

To get to Ejin Qi is a demanding 400-mile overland trip: three days across dry desert valleys and through jagged mountain passes. Unlike the Badain Jaran and Tengger Deserts to our south, the northern part of the Alashan has been raked by relentless winds off the steppe to the north, leaving exposed rock everywhere. There is little water, so few herdsman live here. Despite long hours behind the wheel, we are lucky to find one lonely encampment a day. Only when we get within about 50 miles of Ejin Qi do we encounter dunes again, great rolling pillows of sand. Here the sand covers roads and devours telephone and electric lines as it blows south from the deserts of Mongolia toward the megadunes of the Badain Jaran.

In Ejin Qi we find a city of 14,000 that is vital and new and full of young people. There are fresh tile sidewalks and pin-neat shops. There is work in construction, in engine repair, in making and selling goods and clothing. In the cafés and restaurants and movie theaters everyone, it seems, is carrying a cellular telephone.

Ejin Qi has always been surrounded by desert, but a drought in recent years has brought such diminishing returns to farming that civic leaders have now gone capitalist, turning a raptor's eye toward a new, tourism-based economy. Our visit happens to coincide with the area's first cultural heritage festival, a tourist-minded event honoring the native Mongolians who settled the area and are now a minority as China's Han majority floods in. As the four-day celebration unfurls,

Civic leaders have now gone capitalist, turning a raptor's eye toward a new, tourism-based economy.

Steady winds scour sediments from overlying rock, forming ridges called yardangs. Shrinking a mud to form one, these yardangs near Yumen, Gansu are among the tallest and most extensive in Asia.

it too is active and bright and well put-together, with traditional Mongolian dances, demonstrations of Mongolia's traditional wrestling, horsemanship, and archery. There is food: bubbling mutton kebabs seared over red-hot braziers. There is drink: hot tea and Coke, strong rice wine and the ever present tall green bottles of warm Chinese beer. In the lilting and clipped tones of the Mongolian language, songs are sung—usually about the toughness of the Mongolian horse—often accompanied by dancing troupes of Mongolian men and women dressed in traditional red robes bound by sashes around their waists. The festivities all take place in a pavilion beneath towering, golden-leaved poplars.

While I enjoy the festival, the locals are thrilled with its effect on the town. The hotels and restaurants are full, and, caught up in the party, natives and visitors alike spend money freely. Ironically the only people in Ejin Qi not attending are the area's few remaining farmers: Mongolians whose fields are close enough to underground water sources to irrigate crops from wells.

At one farm near the festival pavilion, inside a shady grove of poplars,

Urban families flock to Shapotou, where camel rides and dune sledding offer a tamed taste of desert life. At the nearby Institute of Desert Research, scientists seek ways to repair damage that poorly planned development has caused to China's arid landscapes.

"Some things this new population is bringing, I do not like. At all."

a 37-year-old Mongolian woman named De Qiqige and her husband and 17-year-old son occupy the ger where she was born. Dressed in gray trousers and a white sweater, she invites Dong, Steinmetz, and me inside for a cup of tea. While theirs is a traditional Mongolian house, it is not one Lao Ji would recognize back in the Badain Jaran. The satellite television on one wall is flashing a Jackie Chan movie. In the kitchen area are a gas stove and electric appliances.

"We live between two worlds these days," De Qiqige says. "I love many of the modern things, but some things this new population is bringing, I do not like. At all."

The drought in this part of the Alashan, she says, began in 1982. "They were diverting the rivers upstream for irrigation, and one day there was simply no more water in the river. It dried up." De Qiqige sips her tea. In the years since she was a child, the grasses have disappeared, she says. Their land cannot support the 300 sheep and goats it used to. Now they have only 200 animals, and government officials have suggested her family cut the herd to 100 or less.

"The government is talking about relocating us too. Away from this place where my father lived his entire life, away from where I was born. I have no argument with the people upriver who have taken the water. They get their water before me. They are trying to make the best farm they can. But my land is dying. The river is dry. The livestock are weak. Soon we will be gone. Like Khara Khoto we will be destroyed after being weakened by thirst. I'll show you."

Putting down her tea, De Qiqige leaves the ger. She begins walking up a hillside behind her house; the hill's powdery dirt makes puffs beneath her shoes. We come over the hilltop. Ahead of us, a small tractor is pushing dirt around an equally dusty field. I can barely see the machine through the gritty clouds. "That is my husband," De Qiqige says. "He is preparing this ground for next year. We are digging a new well in the middle of this field, to irrigate it. It will cost all of our savings to do this. If we have a bad harvest next year, we could lose everything."

De Qiqige's husband won't talk. He's too busy, he says. But I sense desperation; I can see it in his eyes. I also realize I'm standing inside the Institute of Desert Research's statistics: 400 million Chinese affected by encroaching desert each year, 950 square miles of land gone.

"So this is desertification?" I ask Dong.

As he did back in the Badain Jaran, Dong stops walking and reaches down. He picks up a handful of powdery dirt and lets it sift through his fingers. "This is it," he says. "No nutrients. Nothing to bind this soil together. This is land falling into desert. Very bad."

Ahead of us, at the far side of the field, the river lies empty. We walk to its bank, then look down to see sand where water should be. Trees line the shoreline, their leaves red and gold at the height of autumn's color. I step nearer the edge of the steeply cut bank, which plummets a dozen feet to the dry river's floor.

"There you are," De Qiqige says. "We are becoming Khara Khoto."

Where fish should be swimming, a six-inch lizard—colored the same pale brown as the dry riverbed—scrambles across the sand. It pauses, curling its tail into a tight loop, then darts beneath a flat rock. ☐

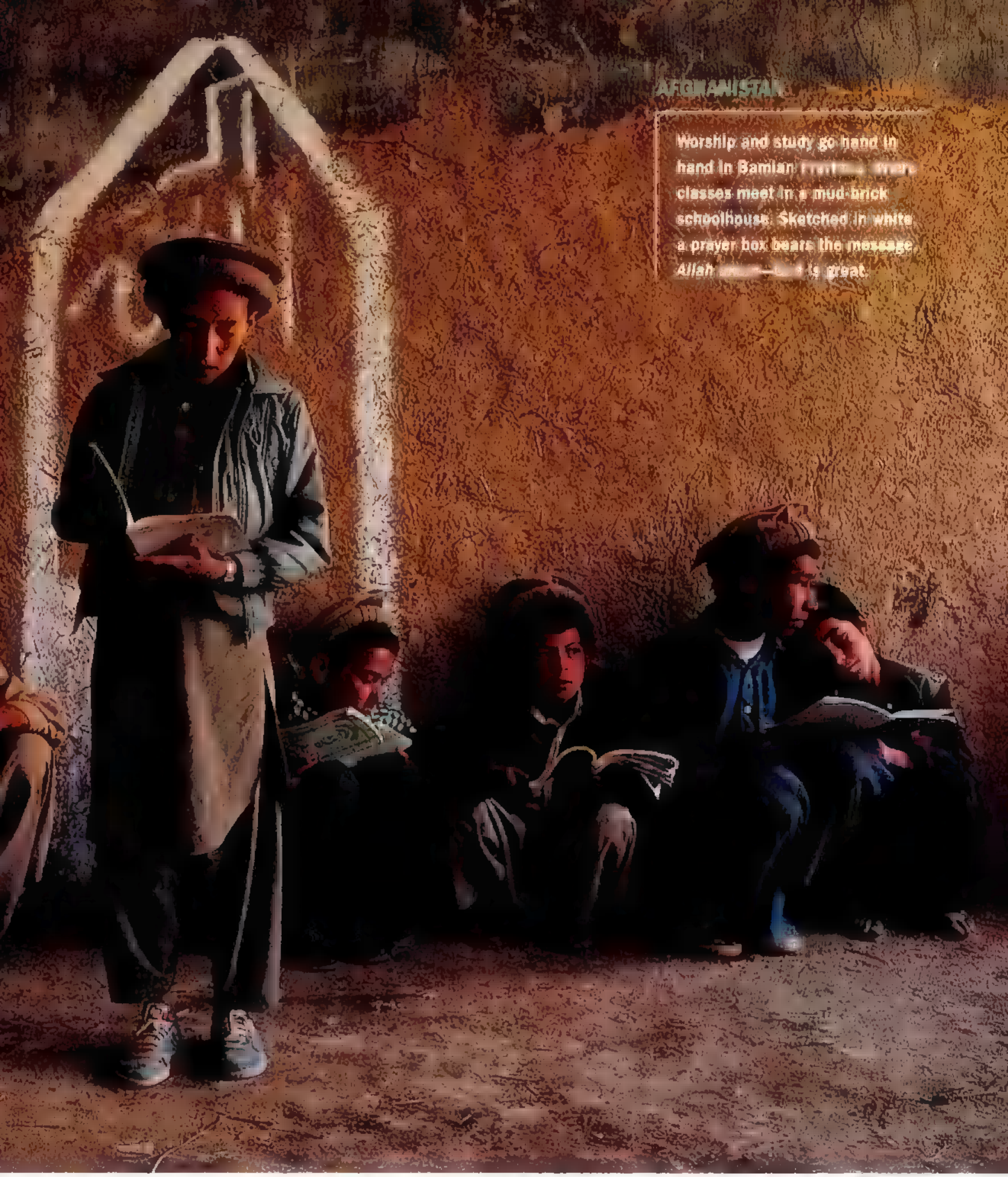
MORE ON OUR WEBSITE

Donovan Webster and George Steinmetz reflect on the joys and perils of working in the Gobi desert at **nationalgeographic.com/ngm/0201.**
AOL Keyword: NatGeoMag

A FIFTH OF HUMANKIND FOLLOWS ISLAM, THE FASTEST GROWING AND PERHAPS MOST MISUNDERSTOOD RELIGION ON EARTH. FACED WITH A SECULAR MODERN WORLD, MUSLIMS ARE TURNING ANEW TO THE ROOTS OF THEIR FAITH.

BY DON BELT
SENIOR EDITOR

The World of Islam



STEVE McCURRY

BORNE ALOFT five times a day, from Shanghai to Chicago, Jakarta to Timbuktu, the music of Islam's call to prayer stirs the soul of devout Muslims everywhere. Whether cast from metal loudspeakers over teeming city streets or lifted as the murmured song of camel drivers kneeling in the sand, it begins with the same Arabic phrase Muslims have used for nearly 1,400 years, Islam's melodic paean to the Creator.

"*Allah . . . u akbar,*" the faithful sing out. "*Allahhhhh . . . u akbar!*—God is great!"

Some 1.3 billion human beings—one person in five—heed Islam's call in the modern world, embracing the religion at a rate that makes it the fastest growing on Earth, with 80 percent of believers now outside the Arab world. For these people Islam is an intimate

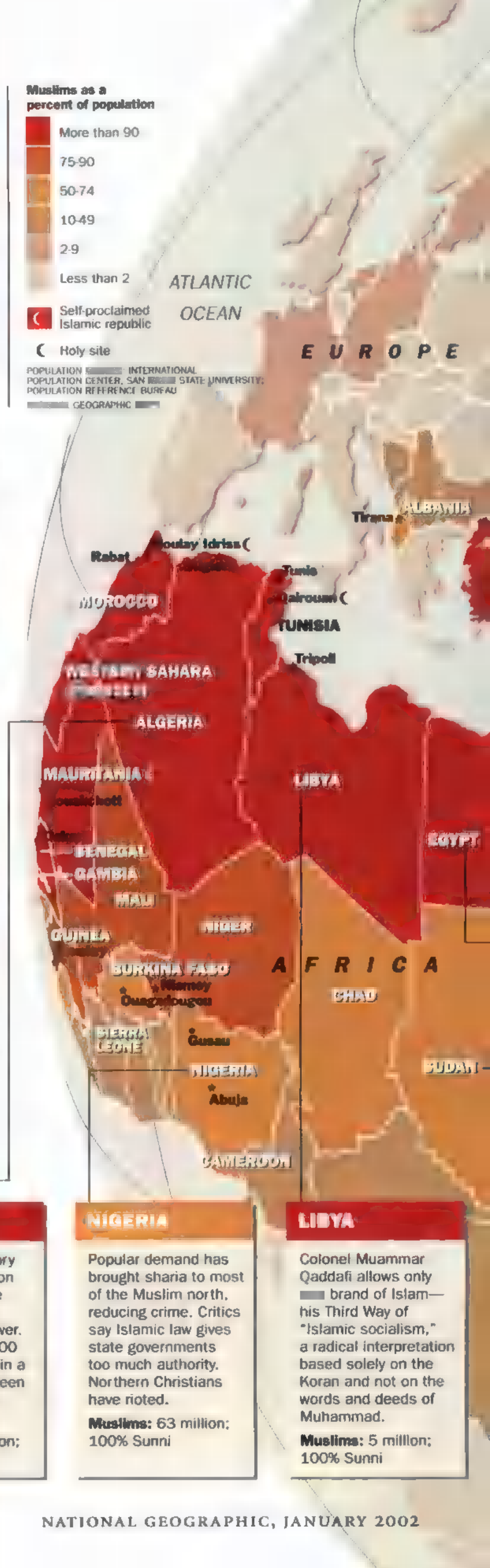
INSIDE ISLAM

FAITH AND POLITICS: A VOLATILE MIX

For nearly 1,400 years Islam, though diverse in sectarian practice and ethnic tradition, has provided a unifying faith for peoples stretching from the Atlantic to the Indian Ocean and beyond. Starting in the 1500s, Western ascendancy, which culminated in colonization, eroded once glorious Muslim empires and reduced the influence of Islam. After the breakup of the Ottoman Empire following World War I and the decline of European colonial empires following World War II, Muslim nations adopted Western ideologies—communism, socialism, secular nationalism, and capitalism. Yet most Muslims remained poor and powerless. Their governments, secular regimes often backed by the West, were corrupt and repressive.

Muslims looked to their religion for answers, sparking an Islamic revival—whose proponents are known as Islamists—that has taken different forms in different countries. Westerners often call these movements "fundamentalism" and assume they are antimodern. However, not all Islamists, who range from moderate to militant, support rigid approaches to their religion, the universal imposition of *sharia* (Islamic law), or a return to premodern ways. Instead, they struggle to resist what they see as an invasion of Western culture and to find an Islamic way to reorder the institutions of their societies.

When, in the 1970s, the movements began in earnest, Islamism drew its members mainly from the young and poor, the uneducated and uprooted. Today Islamism reflects mainstream Muslim thought. Initially inspired by the 1979 Islamic Revolution in Iran, Islamist groups such as the Muslim Brotherhood have become potent political forces secular governments must contend with. Islamist groups have never been allowed to gain control of governments through elections; many, however, are represented in legislatures. A few, starting in Iran, have established Islamic states. Most of these regimes, like their secular predecessors, have failed to establish democracies or uphold human rights. The age-old Islamic vision of a peaceful, just, and humane society remains unfulfilled.



ALGERIA

In 1992 the military stopped an election rather than let the Islamic Salvation Front come to power. Since then 100,000 people have died in a war of terror between Islamists and the government.

Muslims: 31 million; 100% Sunni

NIGERIA

Popular demand has brought sharia to most of the Muslim north, reducing crime. Critics say Islamic law gives state governments too much authority. Northern Christians have rioted.

Muslims: 63 million; 100% Sunni

LIBYA

Colonel Muammar Qaddafi allows only one brand of Islam—his Third Way of "Islamic socialism," a radical interpretation based solely on the Koran and not on the words and deeds of Muhammad.

Muslims: 5 million; 100% Sunni

TURKEY

Modern Turkey was founded in 1923 as a Western, secular democracy. The army has intervened to remove Islamists from office. Head scarves are banned on college campuses.

Muslims: 66 million; 95% Sunni, 5% Shiite

SYRIA

The rulers of the minority Alawite sect maintain their grip on power through force. Faced with an uprising by Sunni Islamists in 1982, they leveled the city of Hamah, killing perhaps 20,000.

Muslims: 15 million; 84% Sunni, 12% Alawite, 4% other

IRAN

Two decades after revolutionaries toppled the shah, the country is still governed by clerics. Reformers hope to increase the powers of the elected president and parliament, fostering democracy.

Muslims: 65 million; 90% Shiite, 10% Sunni

AFGHANISTAN

Schooled in a conservative form of Islam when refugees in Pakistan, the militant Taliban brought a cruel order to their country after its civil war: Executions are common; women have virtually no rights.

Muslims: 27 million; 85% Sunni, 15% Shiite

PAKISTAN

Created with the partition of India in 1947, this Muslim homeland combines secular and Islamic law and is now under military control. A moderate Islamist party offers education, health care, and an alternative at the polls.

Muslims: 141 million; 79% Sunni, 21% Shiite

CHINA

Among Muslims in the northwest, ■ influx of Han Chinese, economic discrimination, and the arrival of militant Islamism fuel separatist tensions and violence.

Muslims: 38 million; 99% Sunni, 1% Shiite

BANGLADESH

In 1971 Islamists fought against secession from Pakistan and were jailed or killed. Today they play ■ major role in the country's secular democracy, while rural clerics enforce Islamic laws.

Muslims: 111 million; 99% Sunni, 1% Shiite

INDONESIA

With the end of 32 years of Suharto's secular nationalism, moderate Islamist parties dominate a newly elected democratic government. Islamic schools, credit unions, and busi- flourish.

Muslims: 181 million; 100% Sunni

INDIA

In Kashmir, Pakistan-backed Muslim militants fight for independence. Elsewhere Muslims—12 percent of the population—are ■ swing vote in a political scene dominated by Hindu nationalists.

Muslims: 124 million; 75% Sunni, 25% Shiite

IRAQ

Saddam Hussein tolerates no opposition and excludes the Shiite majority from power. Proven enemy of the West, he presents his secular police state as the hope of the Muslim masses.

Muslims: 23 million; 60% Shiite, 40% Sunni

SAUDI ARABIA

The oil-rich land of Islam's birth is governed by a wealthy monarchy, which imposes a strict interpretation of Islam—Wahhabism—that it tries to export abroad. The minority Shiites are persecuted.

Muslims: 21 million; 85% Sunni, 15% Shiite

SUDAN

A fundamentalist military government in the Muslim Arab north pursues a jihad against the black African, mostly non-Muslim south. The conflict is now as much about oil and land as about religion.

Muslims: 22 million; 100% Sunni

EGYPT

Muslim Brotherhood members ■ in parliament, but the military-backed government continues an official ban against the party, fearing its ties to extremists who have attacked Egyptians and tourists.

Muslims: 66 million; 99% Sunni, 1% other

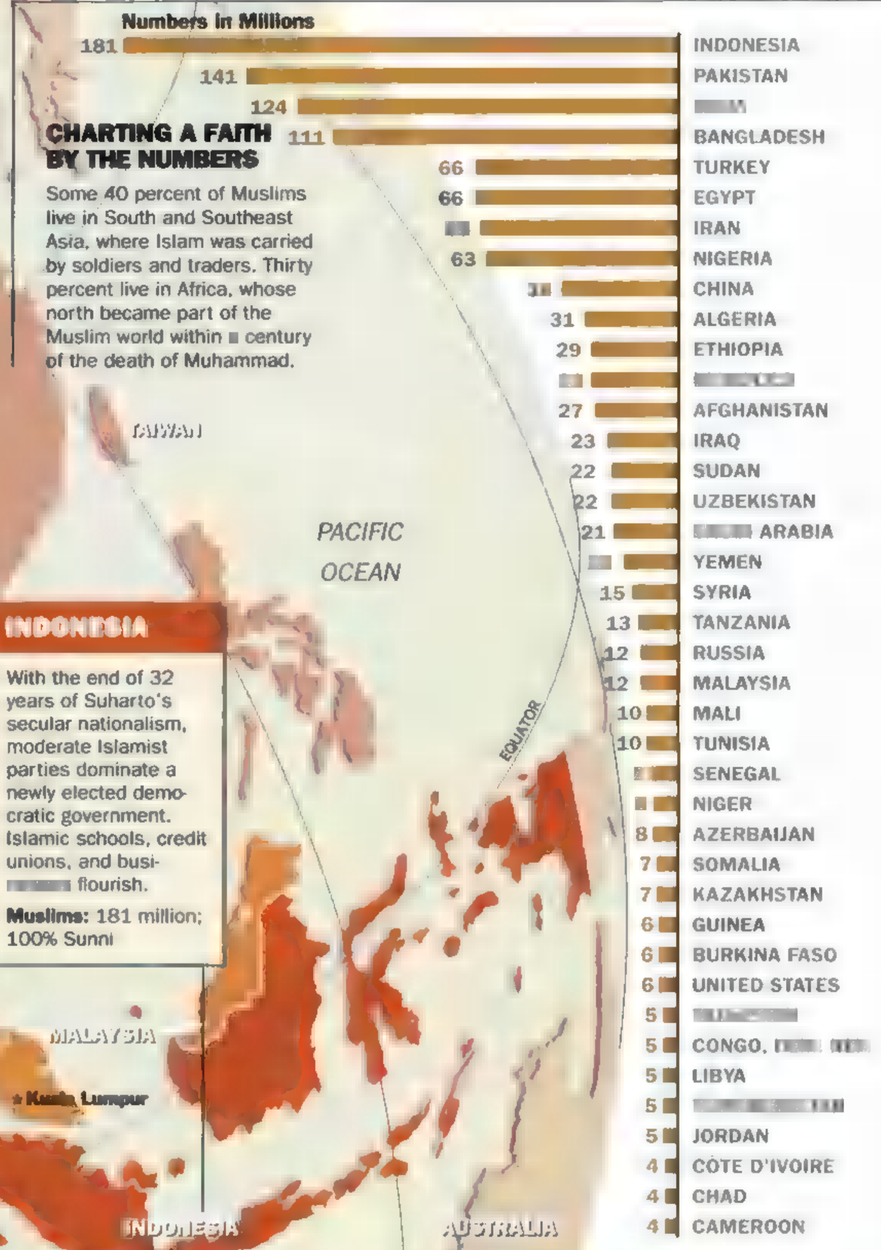
JORDAN

The royal family enjoys the ultimate in legitimacy—descent from the Prophet. It has pursued a Western, secular course, while allowing Islamists to win seats and change laws in parliament.

Muslims: 5 million; 99.9% Sunni, 0.1% Shiite

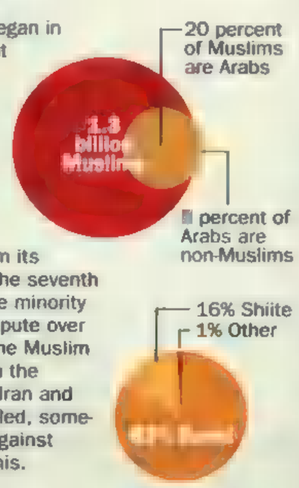
CHARTING A FAITH BY THE NUMBERS

Some 40 percent of Muslims live in South and Southeast Asia, where Islam was carried by soldiers and traders. Thirty percent live in Africa, whose north became part of the Muslim world within ■ century of the death of Muhammad.



MUSLIMS AND ARABS

Although Islam began in Arabia, only about 20 percent of Muslims live in the Arab-speaking world. Islam's two main branches, the Sunni and the Shiite, arose from its earliest days in the seventh century, when the minority Shiites lost ■ dispute over who would rule the Muslim world. Since then the Shiites, many in Iran and Iraq, have struggled, sometimes violently, against the majority Sunnis.



THE WORLD'S LARGEST RELIGIONS

More than one-fifth of humankind follows Islam, which, due to high birthrates and conversions, is the world's fastest growing religion.

CHRISTIANITY
2 billion

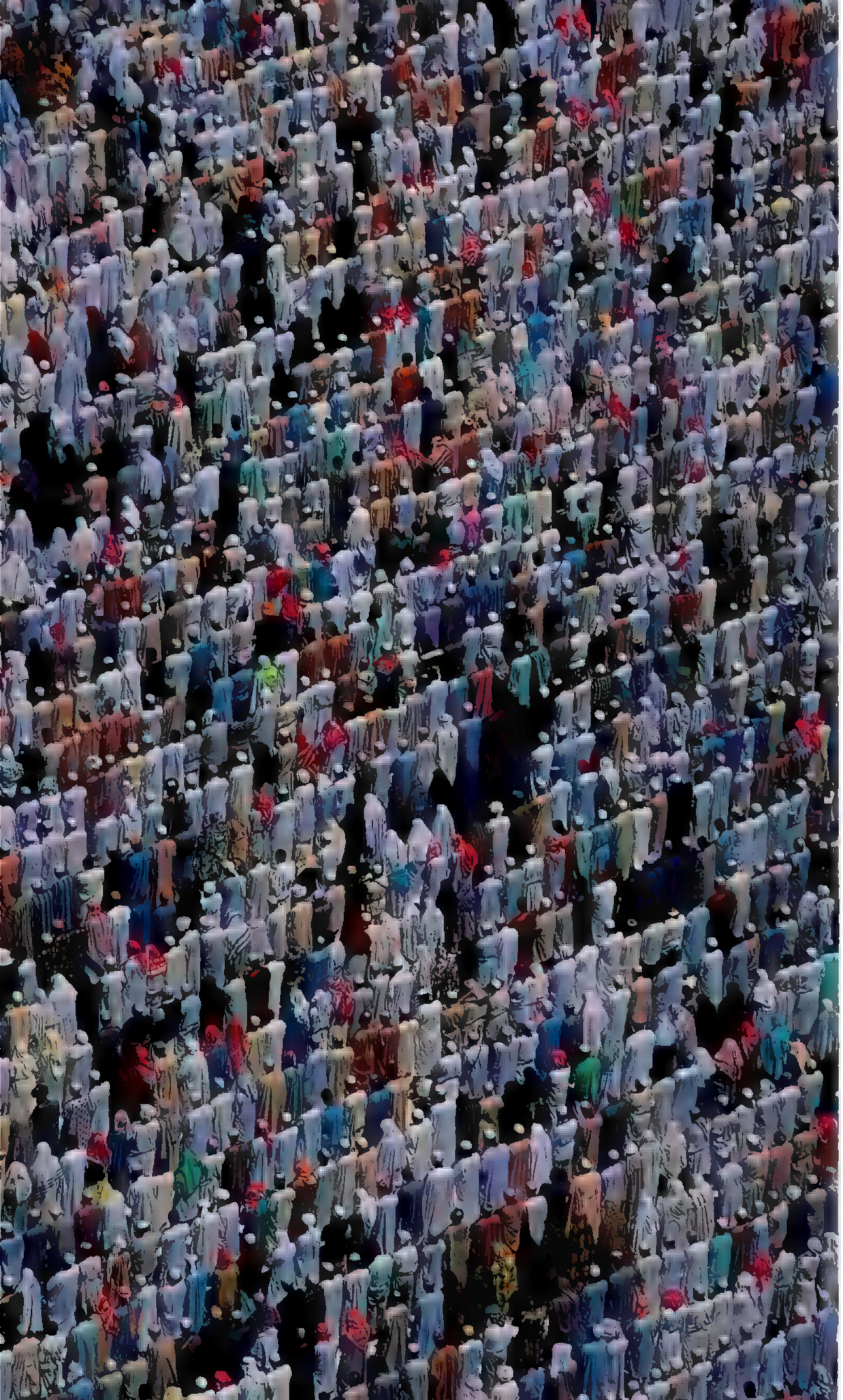
ISLAM
1.3 billion

HINDUISM
900 million

BUDDHISM
[illegible] million

THE NEW WORLD

Most Muslims in the Western Hemisphere live in the United States. There are ■ many American Muslims ■ American Jews—roughly 2 percent of the population in each case. However, since they are ethnically diverse and most are newcomers, Muslims have far less political influence. Two-thirds belong to immigrant families, and one-third are African Americans who converted since the 1960s, returning to the religion of some of their forebears. The majority of American Muslims support ■ secular, democratic state and are ecumenically oriented, willing to bridge religious and sectarian divides.



personal connection to the same God worshiped by Jews and Christians, a source of strength and hope in a troubled world.

The term itself, Islam, is an Arabic word meaning "submission to God," with its etymological roots firmly planted in *salam*, or peace. That may come as a surprise to many non-Muslims, whose perceptions of the faith have been skewed by terrorists, many from the Middle East, whose unspeakable acts in the name of Islam have been condemned by leaders everywhere.

"Peace is the essence of Islam," says Prince El Hassan bin Talal of Jordan, brother of the late King Hussein and a descendant of the Prophet Muhammad. Prince El Hassan helps lead the World Conference on Religion and Peace and spends much of his energy building bridges of understanding between the Muslim world and the West. "Respecting the sanctity of life is the cornerstone of our faith," he says, "and of all great faiths."

Like Judaism and Christianity, Islam traces its lineage to the prophet Ibrahim (Abraham*), a wandering Bronze Age shepherd with whom God (*Allah* in Arabic) made covenants that became the foundation of the three faiths. Muslims revere the Hebrew prophets, including Moses, and regard the Old and New Testaments as an integral part of their tradition. They disagree with Christians about the divinity of Jesus but honor him as an especially esteemed messenger from God. The ultimate messenger for Muslims is the Prophet Muhammad.

Born about A.D. 570 at Mecca in present-day Saudi Arabia, Muhammad was an orphan raised by his grandfather and uncle. He grew up to be a modest and respected businessman who rejected the widespread polytheism of his day and turned to the one God worshiped by the region's Christian and Jewish communities.

At about age 40 Muhammad retreated to a cave in the mountains outside Mecca to meditate. There, Muslims believe, he was visited by the archangel Gabriel, who began reciting to him the Word of God. Until his death 23 years later, Muhammad passed along these revelations to a growing band of followers, including many who wrote down the words or committed them to memory. These verses, compiled soon after Muhammad's death, became the Koran, or "recitation," considered by Muslims the literal Word of God and a refinement of the Jewish and Christian scriptures.

THE KORAN consists of 114 *suras*, or chapters, and covers everything from the nature of God (compassionate and merciful) to laws governing the mundane affairs of men. Do not usurp one another's property by unjust means, it commands. Kill no game while on pilgrimage.

Its underlying message is "a prescription for harmony in everyday life," says Sheikh Anwar al-Awlaki, the *imam*, or spiritual leader, of the Dar al-Hijara Mosque just outside Washington, D.C. "In the Koran, God commands us to be merciful with one another, to live an ethical life. These concepts are not new, of course; the Koran confirms many of the teachings already laid down in the Bible. In many ways God's message in the Koran boils down to 'treat others better than they treat you.'"

For Muslims the Koran is also a poetic touchstone, a source of the pure Arabic language memorized by Muslim schoolchildren and recited by Muslim adults on every important occasion—weddings, funerals,

*See "Abraham: Journey of Faith," by Tad Szulc, December 2001.

REZA (FAR LEFT), STEVE RAYMER, ASIA IMAGES (LEFT); MALCOLM LINTON

Speaking the body language of Islam—submission—Muslims pray in Mecca (far left), home of the Prophet Muhammad. Seen by Muslims as a culmination of Judaism and Christianity, Islam is practiced by a mosaic of cultures, from the sidewalks of Kuala Lumpur (left) to the sands of Gusau, Nigeria, where a vendor sells the holy Koran.

holidays. In a religion that forbids statuary and icons, this book is the physical manifestation of the faith, and small, tattered copies of it are found tucked into the pockets of every shopkeeper in the Muslim world.

Just as verses of the Bible can be pulled out of context and made to march to a zealot's cause, so is the Koran subject to distortion. A verse that counsels women to adopt modest dress and behavior is widely read as good practical advice; other interpretations supply the Taliban with a rationale to imprison Afghan women in their homes. Verses prescribing *jihad*, or struggle, against the enemies of God are usually taken to mean the internal striving of each individual for spiritual purity and enlightenment. Others describe Muhammad's armed struggle against his enemies and give the radicals of today a pretext, however twisted, for waging a holy war against nonbelievers.

Such interpretations cannot be overruled, because Islam is a faith without an established hierarchy; there is no Muslim pope, no excommunication of heretics. So while an imam can offer his congregants guidance and scholarship, in the end Islam's authority resides in its scripture, freeing individuals to interpret the Word of God in their own way. The Koran itself acknowledges this dilemma in Sura III:7: "Some . . . verses are precise in meaning—they are the foundation of the Book—and others ambiguous. Those whose hearts are infected with disbelief follow the ambiguous part, so as to create dissension . . . no one knows its meaning except God."

God forbade religious coercion but directed

Muhammad to declare his new faith among the people of his region—no small task, given the vicious tribal warfare and idol worship rampant in seventh-century Mecca, much of it focused on the Kaaba. This cube-shaped shrine was used for pagan rituals to honor a pantheon of deities. Muhammad and his followers were ridiculed and violently attacked for their belief in a single, unseen God.

After a decade of persecution Muhammad and his followers migrated to Medina, a city some 200 miles from Mecca, where the Prophet won more converts and eventually came to govern the town. After several years he and a small army of the faithful returned to Mecca, took the city, destroyed the idols of the Kaaba, and rededicated it to the God of Abraham. From that time to this, pilgrims have revered the Kaaba as the holiest shrine in Islam, reenacting the Prophet's journey to Mecca in the annual hajj, or pilgrimage, which draws as many as 2.5 million Muslims from all over the world to circle the Kaaba in the footsteps of Abraham and Muhammad.

One of the Five Pillars of Islam (along with fasting in the holy month of Ramadan, prayer, charity, and profession of faith), the hajj is required of all who can manage it at least once in a lifetime.

"I am now a *hajji!*" beamed Hamoudi bin Nweijah al-Bedoul, a Bedouin man of middle age living in the rock-strewn deserts southeast of the Dead Sea. His reaction was typical of Muslims returning from the hajj for the first time. "It was me and my mother, and a million people just like us. We took a bus for a week, all the way to Mecca. My mother cried the whole way back."

By the time the Prophet died in A.D. 632, Islam was established throughout the Arabian Peninsula, bringing peace and unity to the tribes for the first time in memory. Within a century of his death the armies of Islam, empowered by faith, had conquered a vast swath of territory stretching from India to the Atlantic coasts of Spain and Portugal, including North Africa and the Middle East.

This Islamic world built on the intellectual achievements of the Roman and Persian cultures it usurped, sponsoring an explosion of learning unparalleled until the Renaissance. According to historian Bernard Lewis of Princeton University, Islam's unsung heroes included its translators, who preserved the classics of the ancient world in "epoch-making" Arabic versions of Greek texts on "mathematics and astronomy, physics and chemistry, medicine and pharmacology, geography and agronomy, and a wide range of other subjects including, notably, philosophy." At a time when Europe was languishing in the early Middle Ages, Muslim scholars and thinkers were giving the world a great center of Islamic learning (Al-Azhar in Cairo) and refining everything from architecture to the use of numbers. At the same time, seagoing Muslim traders were spreading the faith to southern Asia, China, and the east coast of Africa.

Flourishing by the end of the first millennium, the realm of Islam was tested as western Europe, spurred by its contact with the Islamic Near East, awoke and lashed out, launching a series of armed Crusades to wrest the Holy

PAKISTAN

Islam's artistic glory reflects from the 1494 tomb of Bibi Jawindi, a holy [illegible] revered by Muslims in the Punjab. Like North Africa and the Mid[illegible]n East, Punjab fell to Islamic armies after Muhammad's death in 632.

KASHI

مَن قَتَلَ نَفْسًا بِغَيْرِ نَفْسٍ أَوْ فَسَادٍ فِي ٱلْأَرْضِ فَكَأَنَّمَا قَتَلَ ٱلنَّاسَ جَمِيعًا

Whoever killed a human being, except as punishment for murder or other villainy in the land, shall be deemed as though he had killed all mankind. Koran V:32

Land, including the Christian shrines of Jerusalem, from Muslim control.

Though fragmented and initially overcome, Muslims rallied to ultimately defeat the invading Christian armies, whose blood-soaked legacy—the indiscriminate killing of thousands of innocent Arabs, Muslim and Christian alike, as well as the Jews of Jerusalem—lives on in the minds of Middle Easterners to this day.

As Europe rose to glory during the Renaissance and beyond, the Islamic world continued to thrive after the creation of the Ottoman Empire in the late 1200s. This powerful state fell at the end of World War I, resulting in the subdivision of its mostly Muslim lands into the Middle Eastern countries we know today.

Although a few Muslim nations are wealthy from oil resources, most are poor and increasingly demoralized by their position in the world. Few Muslim societies enjoy the range of civil liberties that Western nations take for granted, such as freedom of expression and the right to vote in a fair election. And their populations are booming: Four people out of ten in Muslim countries are under the age of 15.

Disaffected and disenfranchised, many people in these societies are turning to Islam, and to Islamic political movements, to assert their identity and reclaim power over their own lives. In addition many Muslims, especially in the Arab world, are angry at the United States for its support of Israel, its military presence in Saudi Arabia, land of Muslim holy places, and its continuing economic sanctions against Iraq, which are widely perceived to have spared Saddam Hussein but hit the people of Iraq—fellow Muslims—right between the eyes. Muslim societies also have a long-standing love-hate relationship with U.S. popular culture, and these days those intense feelings may be closer to revulsion than respect.

"To many Muslims, especially those in traditional societies, American pop culture looks a lot like old-fashioned paganism, a cult that worships money and sex," says Imam Anwar al-Awlaki. "For such people, Islam is an oasis of old-fashioned family values."

Some Muslim nations, like Iran and Saudi Arabia, today base their governments on *sharia*, or Koranic laws and teachings, which are themselves subject to debate and interpretation. Others, like Malaysia and Jordan, combine these traditional principles of justice with more modern, secular forms of government and society.

For most of the world's 1.3 billion Muslims, Islam is not a political system. It's a way of life, a discipline based on looking at the world through the eyes of faith.

"Islam gave me something that was lacking in my life," says Jennifer Calvo of Washington, D.C. Calvo is 28 and looks as if she just stepped out of a painting by Botticelli, with aquiline features and striking blue eyes, set off by a white head scarf tucked neatly into her full-length robe. Calvo was raised Catholic and works as a registered nurse.

"I used to get so depressed trying to conform to our crazy culture and its image of what a woman should be," she said, "the emphasis we put on looking good—the hair, the makeup, the clothes—and our hunger for material wealth. It left me feeling empty all the time."

Two years ago, as people have done for 1,400 years, Jennifer became a Muslim by simply declaring the words: "*La ilaha illa Allah, Muhammad rasul Allah*—There is no god but God, and Muhammad is his Messenger."

"Everything is so much simpler now," she said. "It's just me and God. For the first time in my life I'm at peace."

For Calvo and most Muslims on Earth, that is what Islam's call to prayer represents. Kneeling to God five times a day, in unison, facing Mecca from wherever they happen to be, they find peace in an act of surrender. □

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AOL Keyword: NatGeoMag

First in a series exploring diversity and dilemma in Earth's

By E. O. Wilson

The biosphere that gives us life is wondrously rich. The number of organisms composing it is astronomical: One million trillion insects are believed to be alive on the planet at any one time; they in turn are beggared by the bacteria, ten billion of which may reside in a single pinch of soil. And so great is the diversity of life-forms that we still have not taken its measure. During the past two centuries biologists have discovered and given formal names to somewhat more than 1.5 million species of plants, animals, and microorganisms, yet various methods of estimation place the number of all species on Earth, known and still unknown, between 3 million and 100 million.

In spite of this immense complexity, perhaps because of it, the biosphere is also very fragile. Although it appears robust, it is actually a hollow shell around the planet so thin it cannot be seen edgewise from an orbiting spacecraft. Its teeming organisms are ill equipped to

HOTSPO

withstand humanity's relentless assault on the habitats in which they live. Our species, at more than six billion strong and heading toward nine billion by mid-century, has become a geophysical force more destructive than storms and droughts. Half the world's forests are gone. Tropical forests in particular, where most of Earth's plant and animal species live, are being clear-cut at the rate of perhaps one percent a year. In shallow waters from the West Indies to the Maldives many of Earth's coral reefs are literally fading away. Polluting, damming, and the introduction of alien organisms are causing the wholesale extinction of native aquatic species. Greenhouse warming, by edging climatic zones poleward faster than flora and fauna can emigrate, threatens the existence of entire ecosystems, including those of the Arctic and other hitherto least disturbed parts of the world.

Researchers generally agree that extant species are now vanishing at least 100 and possibly as much as 10,000 times faster than new ones are being born. Many experts believe that at the present rate of

TAHR (*HEMITRAGUS HYLOCRIUS*), ERAVIKULAM NATIONAL PARK, KERALA, INDIA. FRANS LANTING

T S

Preserving pieces of a fragile biosphere

environmental change half the world's surviving species could be gone by the end of the century.

Is there a way to divert the human juggernaut and save at least most of the remaining natural world? A providential arrangement in the geography of life makes it at least possible. Biodiversity is not distributed uniformly over land and sea. A large part of it is concentrated in a relatively small number of coral reefs, forests, savannas, and other habitats scattered on and around different continents. By preserving these special places, biologists have come to agree, it should be possible to accommodate the continuing human surge while protecting a large part of Earth's threatened fauna and flora.

Among the most precious of the special places are the hotspots, which conservation biologists define as natural environments containing exceptionally large numbers of endangered species found nowhere else. The most familiar hotspots include the Philippines, California's Mediterranean-climate coast, and Madagascar. Less

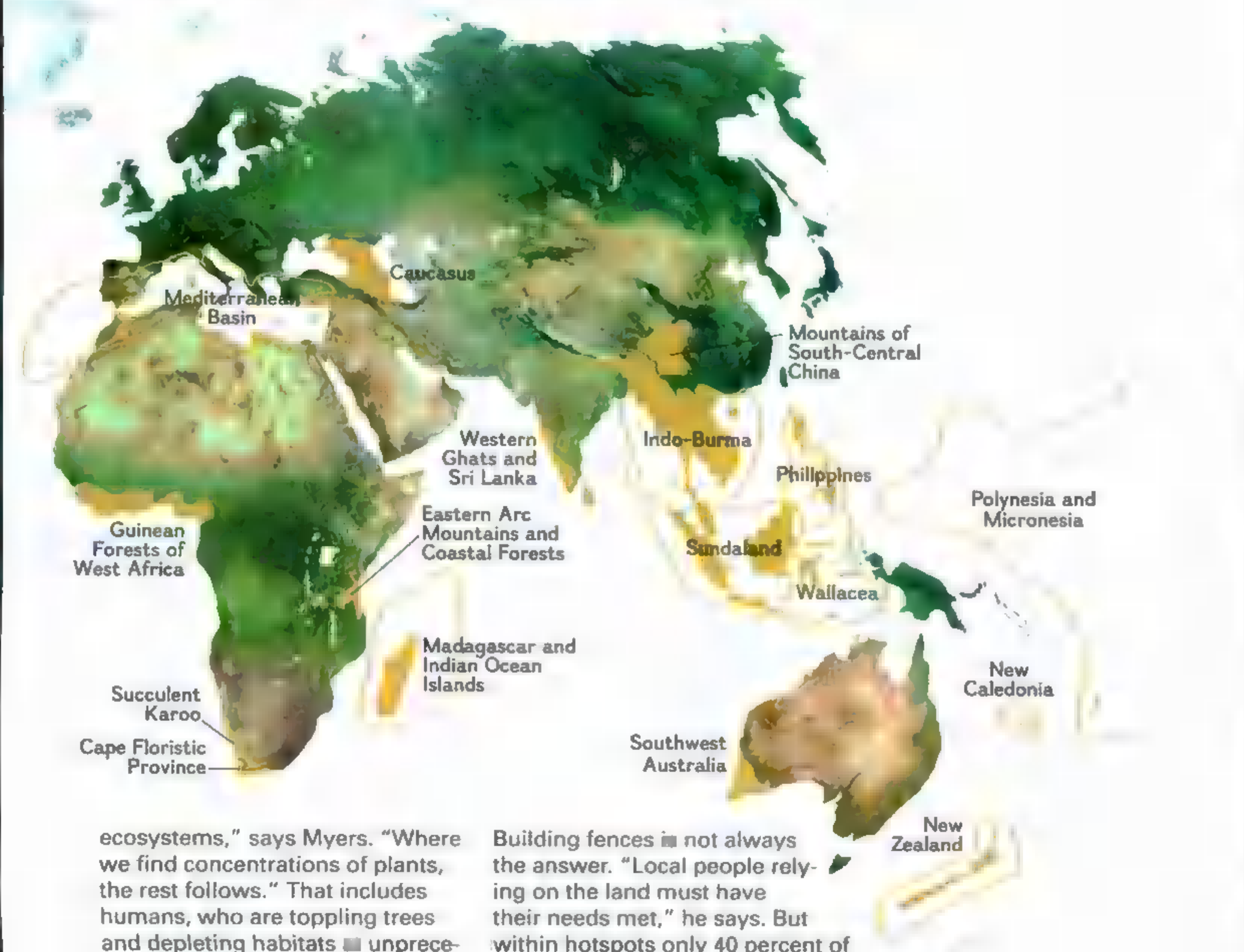
well-known are Chocó-Darién-Western Ecuador, the Western Ghats of India, and the Succulent Karoo of South Africa. Just 25 of the hottest of these hotspots occupy 1.4 percent of the planet's land surface, roughly equivalent to Alaska and Texas combined, yet are the exclusive homes of 44 percent of Earth's plant species and 35 percent of its birds, mammals, reptiles, and amphibians. Increasingly, these areas, among the biologically most opulent and fascinating places on Earth, have become the focus of global conservation efforts. Their plight is stark evidence of humankind's deadly impact on nature, and their attempted rescue a beacon of hope. □

HOTSPOTS AROUND THE GLOBE

Ecologist Norman Myers and Conservation International president Russ Mittermeier were astounded when they calculated that over a third of known land plants and vertebrates are confined to less than 2 percent of the planet. Myers called these highly threatened but fertile grounds—the richest anywhere in endemic plants—hotspots, and he proposed that otherwise scattered conservation funds be focused on their protection. Today Myers, Mittermeier, and more than a hundred other experts have identified hotspots on every continent but Antarctica. "We don't designate hotspots based on tigers or gorillas but on entire

human juggernaut and save at least most of the remaining natural world?

AND CHILD OF NAGARAHOLE PARK, KARNATAKA, INDIA. FRANS LANTING



ecosystems," says Myers. "Where we find concentrations of plants, the rest follows." That includes humans, who are toppling trees and depleting habitats at unprecedented rates—often driven by poverty and sheer numbers.

Building fences is not always the answer. "Local people relying on the land must have their needs met," he says. But within hotspots only 40 percent of the land is protected, leaving even these cores of biodiversity at risk.

NG MAPS
SOURCE: CONSERVATION INTERNATIONAL

SP

India's Western Ghats

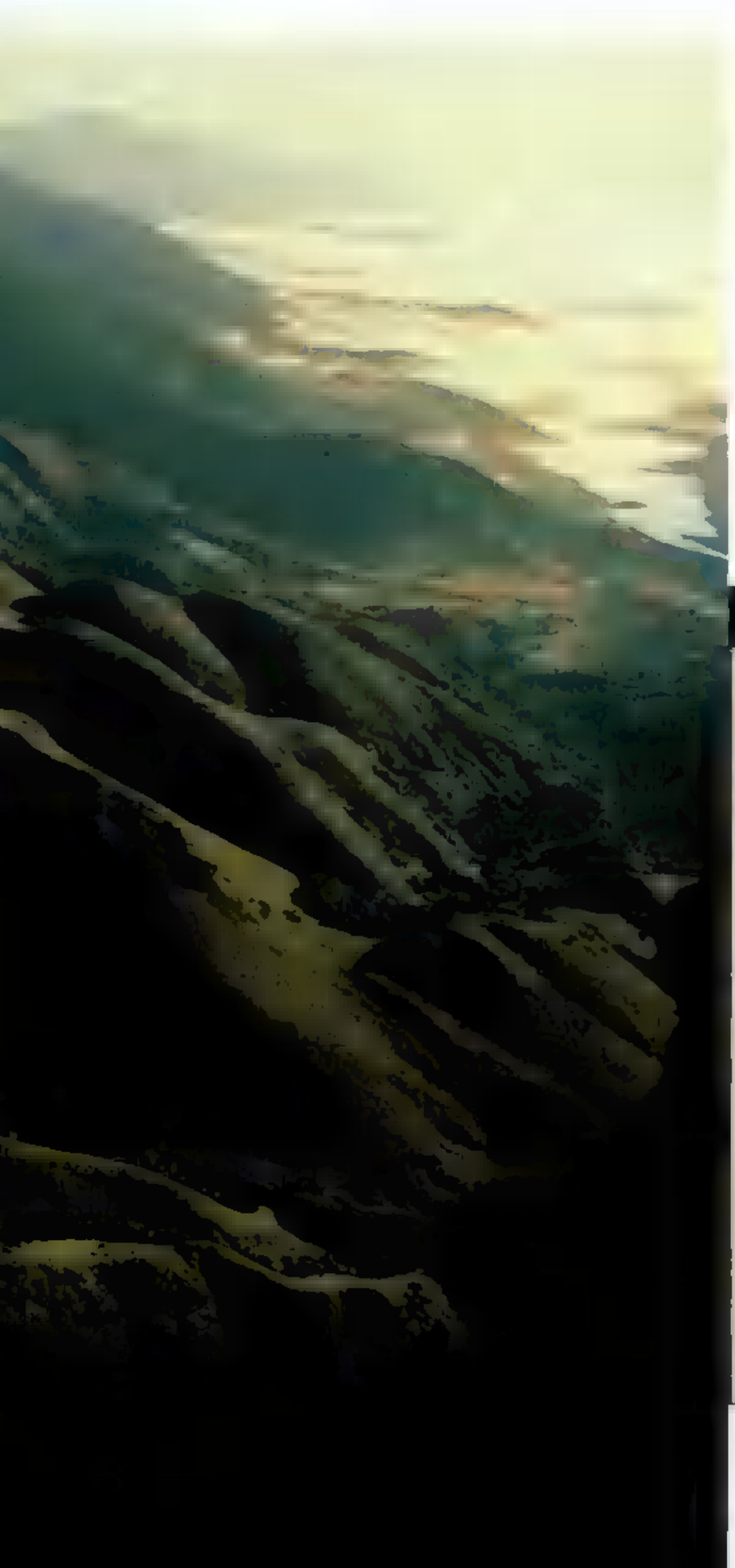
BY GEOFFREY C. WARD
PHOTOGRAPHS BY FRANS LANTING

A delicate wild begonia and a shy lion-tailed macaque have known only one home, the dense rain forests of the Western Ghats mountain range. That world is fragmenting fast, a victim of India's surging population and headlong eagerness to modernize. Now concerned citizens are joining forces to save what is left before it's too late—for forest dwellers and human beings alike.

MACACA SILENUS

Once linked by land, India's Western Ghats (below) and the island nation of Sri Lanka together make up a biodiversity hotspot—a place with threatened natural habitats that are rich in species, especially plants, that live nowhere else.

IN THE WARM early morning light the hilltops of Kudremukh National Park in the southern Indian state of Karnataka seem to roll on forever—a limitless mosaic of golden grassland and the stunted, dark green rain forest called *shola*. There is no sign of other human beings, no sound other than the singing of birds and the steady hum of insects from deep inside the forest. As my two companions and I make our way to the summit, it's easy for a newcomer to believe that the Western Ghats, the mountain chain that runs for nearly ■ thousand miles along India's southwestern coast, have miraculously been left untouched by man.



"I wish that were true," Niren Jain says, surveying the hillsides with his binoculars. "These mountains are a treasure house," Praveen Bhargav adds, "and it's being systematically looted." Jain is a bespectacled architecture graduate, Bhargav a bearded adman, but both are here as members of a Bangalore-based citizens group called Wildlife First!, which pledges to do all it can to halt at least some of that pillaging before it's too late.

The Ghats serve as the principal watershed for all of peninsular India. Each June black, rain-heavy monsoon clouds sweeping in from the Indian Ocean are intercepted by the western summits and relieved of most of their burden—more than 29 feet of rain falls annually in some sections—before moving on to spill what little moisture is left onto the more gradual eastern slopes and the broad Deccan Plateau beyond. Some 60 rivers and countless streams tumble westward down the escarpment. Three of the most important eastward-flowing river systems of peninsular India—the Godavari, Krishna, and Cauvery—have their beginnings here as well and have slaked the thirst and watered the fields of southern Indians for at least 5,000 years.

Located squarely in the tropical zone so that no severe cold can limit diversity and with a wide variety of forest cover, the Ghats yield plant and animal riches only now beginning to be dimly understood. Kudremukh National Park itself was established in 1987 to help preserve the endemic lion-tailed macaque—a reclusive rain forest monkey with a handsome silvery mane—now highly endangered because its habitat has been badly fragmented.

That dispiriting process began in British times but accelerated after India's independence in 1947 as the relentless demands of an exploding population were felt all along the range. Fast-growing commercial exotics like eucalyptus and wattle from Australia replaced precious shola on the high slopes.

HOTSPOTS

WESTERN GHATS

UNDISTURBED FOREST
5,000 square miles, down from 62,000

HABITAT TYPES Evergreen and deciduous forests, grasslands

FLAGSHIP SPECIES
Asian elephant, Indian tiger, lion-tailed macaque, Nilgiri tahr

ENDEMIC SPECIES
1,400 plants; 23 mammals; 17 birds; ■ reptiles; 90 amphibians

PRINCIPAL THREATS
Forest fragmentation, expanding agriculture, dams, mines

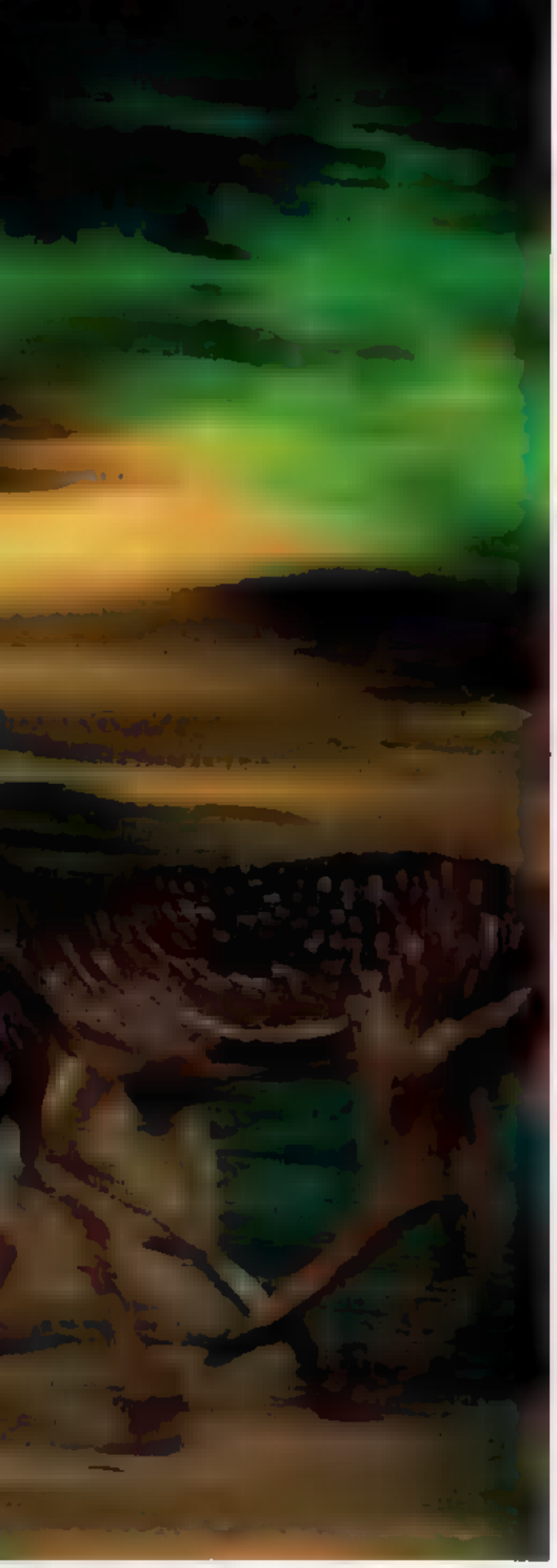
The High Cost of Monoculture

After India's British rulers began commercial exploitation in the 19th century, the unique, ecologically rich mix of rain forest and grassland that once covered the high slopes near Munnar was displaced by tea gardens and groves of eucalyptus trees used to fire the

tea-manufacturing process. Some of the tea these Tamil workers pluck will be served at stalls in Kerala, peninsular India's most densely populated state, where tea drinking is a daily dawn-to-dusk custom. The rest is sent overseas to make a sweet bottled iced tea for sale in American supermarkets.

Lower down, evergreen forests were lost to tea and coffee and cashew and cardamom plantations, to mines and roads and massive irrigation and hydroelectric projects. And even where the canopy looks intact from the air, people are often quietly moving beneath it, poaching, setting fires, irreversibly altering the forest structure by collecting vast quantities of natural products for sale to big-time contractors: wild fruits for the prepared-food industry, rattan for furniture making, a variety of garcinia from which over-the-counter antiobesity remedies are made for sale to the West.

Even here, within the supposedly protected precincts of Kudremukh, the Ghats are under attack. The park that looks so vast from the hilltop is actually relatively small—only 230 square miles. Just out of our sight, but less than a mile away as the crow flies, the Kudremukh Iron Ore Company has been beetling away for 30 years now, methodically eliminating whole hills, ripping open the slopes of those that still stand, turning a once forested valley into a vast lake of red tailings. During the monsoon the Bhadra River, which begins in the heart of the mining area and provides water for hundreds of thousands of people, runs blood-red; its banks several miles downstream are blackened with iron ore; and the silt it carries down from denuded hillsides threatens to destroy an important reservoir 45 miles away. And now, having largely exhausted the area to which it was given a 30-year lease before the park was created, the mining company wants permission to open up new hillsides, to create a new lake of tailings that will drown yet another valley. If it succeeds, Kudremukh's forests will be further divided, their extraordinary diversity further reduced as niche species vanish along with the niches that evolution has equipped them to occupy, and the lion-tailed macaque would



AXIS AXIS

CUON ALPINUS

Daily Drama **In Bandipur National Park in the state of Karnataka the population of ungulates like chital, or spotted deer (left, bounding out of harm's way), is high enough to meet the needs of India's largest predators: leopards, tigers, and dholes, or wild dogs (above). Unlike their big-cat competitors, wild dogs pursue their prey in packs, devour it in a single frenzied sitting, then move on in search of more.**

be still more likely to disappear from the wild.

By the end of the 20th century the 62,000 square miles of undisturbed forest that are believed to have covered the Ghats at the century's beginning had been reduced to fewer than 5,000.

"That's why we're so impatient," Praveen Bhargav explains. The central government at New Delhi was once Indian conservation's most powerful ally, but in recent years power has devolved steadily away from the center toward the states, each of which has its own conflicts over the exploitation of its resources. "Many supposedly protected areas are protected now only on paper," says Bhargav. "Everything used to be left up to government. Now we have to act on our own. It's a full-time job."

Niren Jain agrees and has at least temporarily abandoned architecture for conservation. "Saving Kudremukh," he says, "is more important than designing good-looking buildings."

Wildlife First! is not the only citizens group working to preserve what is left of the Ghats—the mushroom growth of such groups is a hopeful sign for Indian conservation—but it is certainly among the ablest and most focused. Its president is K. M. Chinnappa, the legendary former forest officer whose dedication turned Nagarahole into one of Asia's greatest national parks.* But my old friend Ullas Karanth, conservation scientist for the Wildlife Conservation Society (WCS), headquartered at the Bronx Zoo, is the group's science adviser and the author of its manifesto. He brings both scientific objectivity and uncompromising commitment to the struggle.

"Most 'environmental' organizations concern themselves on some level with the convenience of people," he explains. "We don't. People already occupy 97 percent of this country.

*See "India's Wildlife Dilemma," by Geoffrey C. Ward, NATIONAL GEOGRAPHIC, May 1992.

Their problems should be solved there. The remaining 3 percent should be left primarily for wildlife. We'll work with anyone—Marxists, Gandhians, businessmen, champions of tribal rights—provided it will help save wildlife and they agree to check their ideological baggage at the door."

With so many obstacles in the way, with so many competing pressures on dwindling resources, and with government itself often divided as to how those resources should be allocated, what, I ask, can a few citizens really accomplish?

Ullas seems almost indignant at the question. "Not all politicians are stupid. Sometimes they can do good. You can seek out other concerned people and build alliances. You can kick up a row in the press. You can go to court."

Wildlife First! has done all that and more on behalf of Kudremukh. One result was an order from the Indian Supreme Court demanding that the state explain why it permits mining in a national park in violation of the Indian Wildlife Protection Act. The Karnataka government tendered an awkward compromise: It denied the company's request to expand into new areas but simultaneously declared the present mining area no longer part of the national park so that the digging—and the pollution of the Bhadra River it causes—can continue.

Is Wildlife First! satisfied? "Of course not," Bhargav says. "The state has no right to give

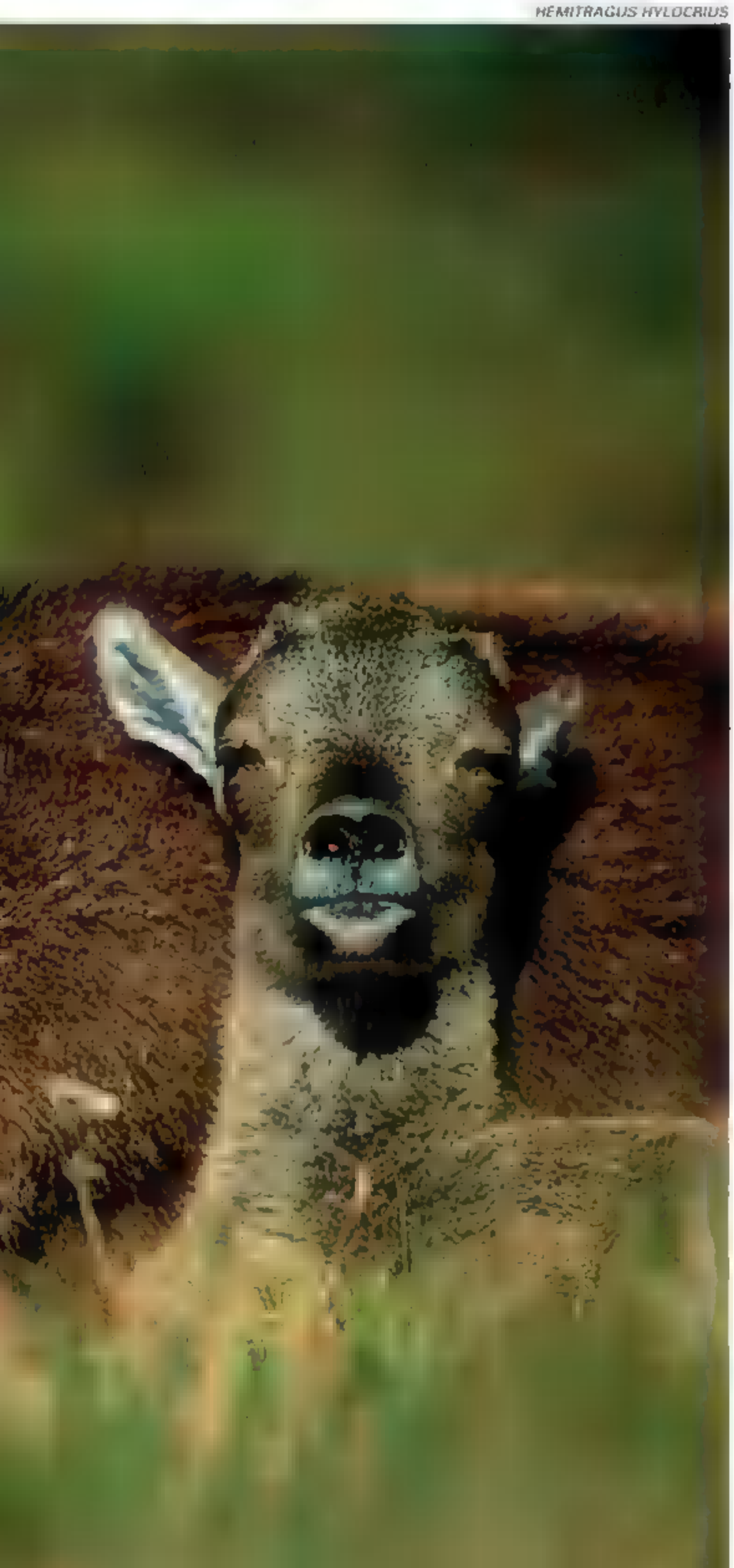
away land from a national park. Our hopes lie with the judiciary."

THE FUTURE of Bhadra Tiger Reserve, less than 30 miles to the northeast, seems more assured than Kudremukh's, though I wouldn't have said so on my first visit there with Ullas five years ago. Bhadra is undeniably beautiful, almost 200 square miles of dense forest bounded on one side by a blue reservoir, on another by green-clad mountains. Four kinds of bamboo—ideal fodder for elephants and the huge wild cattle called gaur—flourish along its streambeds, including a giant variety whose 90-foot culms sway and creak like the timbers of a sailing ship whenever stirred by the slightest breeze. But back in 1997 everything here seemed out of control. The forest was blue with smoke from fires, and without vehicles the understaffed forest department was powerless to put them out. Commercial bamboo cutters were carting away cover essential for wildlife. Timber was disappearing too. Poachers appeared to have a more or less free hand. And there were 16 small villages scattered through the park, their inhabitants sowing rice in natural wetlands while lobbying for electricity, running water, and all-weather roads—amenities that could spell disaster for the fragile forest.

Given that bleak picture, the vehemence of Ullas's belief in Bhadra's potential had startled me. "With proper protection," he assured me, "and if we can find new homes outside the park for the villagers, Bhadra can outpace any forest in India. Even Nagarahole will have to take a backseat." That was a considerable claim at the time. A brief visit to Nagarahole offered insight into the ecological wealth that once characterized the Ghats—and much of India. When Ullas and I drove into the park one evening after dark, our lights captured two sloth bears, their heads buried in a termite mound. As we slowed to a stop, one scuttled into the forest. The other, too intent on lapping up succulent insects to notice us at first, eventually yanked its dust-covered head out of the mound, woofed resentfully, and hustled off. A mile or so farther down the road Ullas slowed again at the sound of elephants crashing into the interior. The whole forest seemed to sway in the dark, and Ullas stepped on the gas.

I was awakened three times that night, first by the calls of panicked spotted deer that had likely sighted a leopard, then by the low spacing call of a distant tiger, finally by elephants trumpeting like half a dozen deranged brass players tuning up. Shortly after dawn the following morning we watched two dozen gaur drift soundlessly across a jungle track and

HEMITRAGUS HYLOCRIUS



Safe Haven

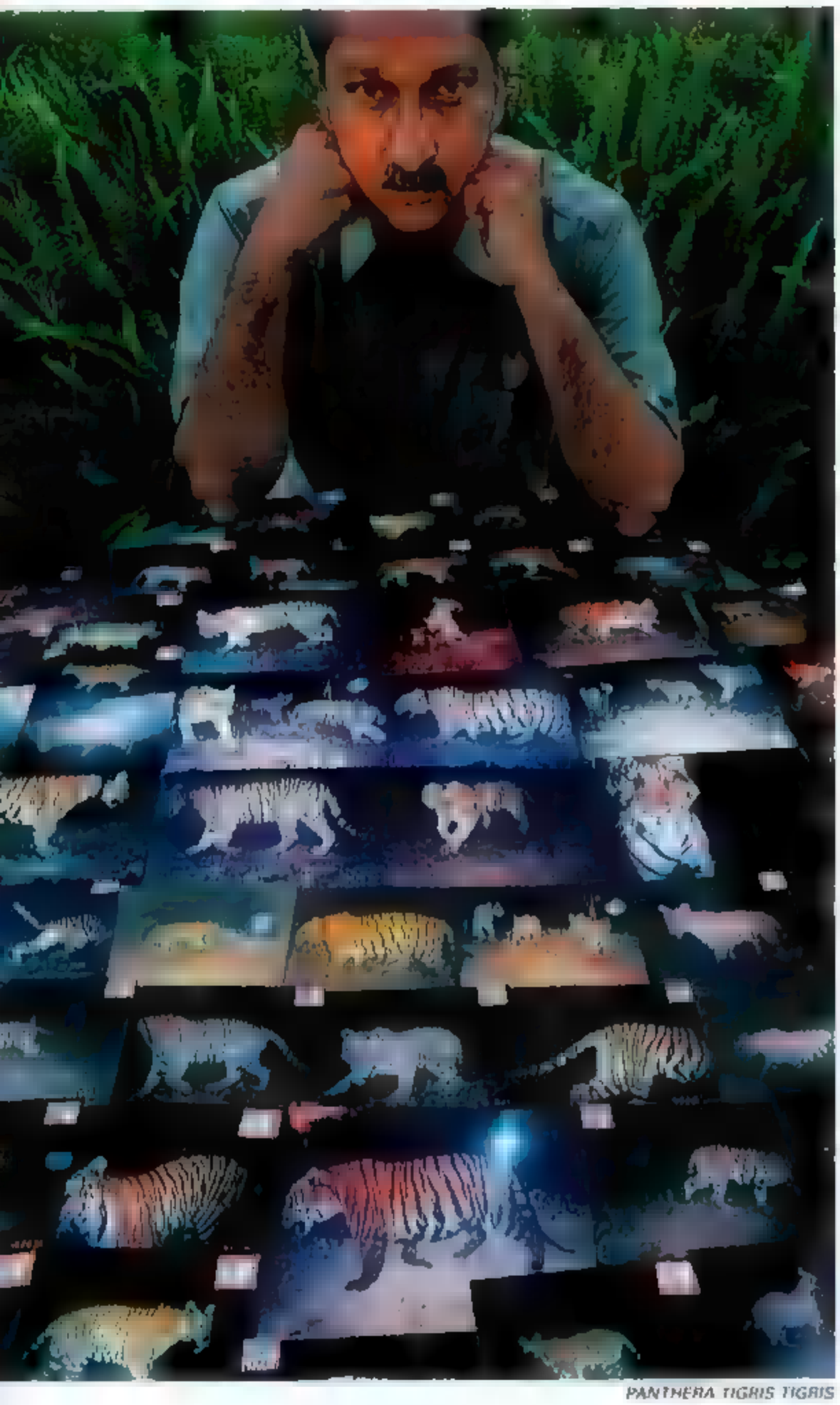
Nilgiri tahr were once so trusting that British hunters killed them with bayonets. Today they remain ■ favorite of poachers. The largest surviving herd has found sanctuary in Eravikulam National Park, where ■ kid snuggles sleepily against its mother.

Out on a Limb

At the start of the spring breeding season a lone spot-billed pelican jostles for roosting room with a painted stork and a flock of black-headed ibis at the Ranganathittu Bird Sanctuary near Mysore. Created by the local maharaja in 1940, the sanctuary encompasses a cluster

PELECANUS PHILIPPENSIS (FACING PAGE, TOP), *MYCTERIA LEUCOCEPHALA* (FACING PAGE, RIGHT), *THRESKIORNIS MELANOCEPHALUS*

of small islands in the Cauvery River, one of the most important of the many watercourses that flow down from the Ghats. Disputes over rights to the Cauvery's precious waters are a continuing source of political friction between the neighboring states of Karnataka and Tamil Nadu.



PANTHERA TIGRIS TIGRIS

Direct Evidence

Tiger self-portraits made at camera traps support the observation of field biologist Ullas Karanth (left) that "good protection and good science are the keys to managing a healthy forest." Both have been in effect at Nagarahole National Park for decades, and a healthy population of elephants (right), as well as tigers, is proof of their effectiveness.

disappear in the mist beneath teak trees so tall they made even those huge bovines look small.

An afternoon boat ride on the lake that separates Nagarahole from Bandipur National Park took us past scores of elephants feeding on tender onshore grasses. There may be more elephants in these two parks than anywhere else in India, and when one lead cow elephant decided it was time to move back into the bamboo at the forest's edge, her band of pushing, shoving followers formed an impressive traffic jam. Near the other end of the vertebrate scale, two muntjac stags, each less than two feet tall, battled furiously on the side of the road that led back to the rest house. Their finger-length antlers locked, they tore at one another with sharp, tusklike canines for several minutes before staggering off separately into the forest, heads down, mouths gaping with exhaustion. The loser's legs trembled violently as he retreated; ribbons of blood flowed down his flanks to splash in the dust.

"Nagarahole wasn't always like this," Ullas reminded me on that trip. "Strict protection made the difference. Having seen what it achieved at Nagarahole, I'm sure it can work at Bhadra too."

To help ensure that protection, Wildlife First! has its own man on the ground at Bhadra, a tall coffee planter named D. V. Girish, who has been coming to the park since his scoutmaster first took him there on a camping trip a quarter of a century ago. "It got into my blood then," he says, "and I can't get it out. The forest department has to do the work, of course, but I'm here to let them know that we will support them when they do their job and will apply pressure when they don't." Under his close scrutiny Bhadra has begun a remarkable comeback. In 1998 it became part of the central government's Project Tiger network, and with help from several overseas organizations led by WCS, there are now enough vehicles to fight fires and undertake serious patrolling. A dynamic officer named D. Yatish Kumar has negotiated an agreement with the paddy growers under which they are to receive irrigated land and other facilities elsewhere, provided they agree to leave the forest. Bamboo cutting has been stopped. Protection has been tightened. Forest guards caught a poacher while I was there, a coffee worker with time on his hands who had killed a rare large brown flying squirrel in its nest and used dogs to run down a striped-necked mongoose and then clubbed it to death. What had he planned to do with his grisly trophies? I asked. "Eat them," he said before being led away.

The forest from which they were plundered is still more beautiful this time around. The giant bamboo, which blooms just once in 45 to 60 years, is in yellow flower, and clouds of rose

Sharing the Waters

Women of the Kuruba tribe make room for a boy mahout and his young charge to cool off in the Moyar River, which flows through Mudumalai Wildlife Sanctuary. The staircase-like profile of flanking mountains lent the Western Ghats their modern [redacted] One meaning of the Hindi

word *ghat* is the flight of steps that leads Hindu pilgrims down to bathe in sacred waters. The ancient Sanskrit name, Sahyadri, or "benevolent mountain," seems even more apt, for without the mountains' ability to absorb monsoon rains and then release them gradually over the rest of the year, life in southern India would be impossible for both man and animal.

finches are squabbling over the seeds. Bhadra's animals are still not habituated to human beings, but through the undergrowth I glimpse plenty of skittish wild boar and sambar and spotted deer; pugmarks reveal that a tigress and two cubs have ambled along the track we follow; and there are clearly plenty of elephants on hand. They are serial defecators, and their cannonball-size droppings and barnyard aroma seem to be everywhere. Best of all, perhaps, the farmers and their families are moving out of the forest, abandoning their paddy fields, which will once again become prime areas for gaur and elephants.

"Come back in another five years and see what's happened," Girish says. "We may ultimately lose the war, but at least in places like this we can win some battles." At Bhadra, thanks to cooperation between forest officials and concerned citizens, the battle seems to be going wildlife's way.

DESPITE ALL THE PRESSURES beating in upon them, Kudremukh and Bhadra remain unmistakably wild. Farther south, in the High Range region of Kerala, it is hard at first to credit that there is still room for any wildlife at all. This has been tea country for more than a century, and as the car carrying me and another old friend, naturalist Hashim Tyabji, switchbacks its way up toward the hill station of Munnar, virtually every inch of the slopes is covered by an undulating quilted blanket of green. Even much of the forest that clings to the hills higher up turns out to be man-made—tidy rows of eucalyptus meant for fueling the tea factories.

Yet just beyond the crest of those hills is Eravikulam National Park, a 37-square-mile plateau too high and cold for growing tea. It may be the last redoubt of the Nilgiri tahr. These endemic, surefooted wild goats were

People Pressure **Men, women, and children packed onto a circular bamboo-and-buffalo-hide coracle (above) make their way to a village celebration on the edge of Bandipur. As the human population grows, unprotected forests are obliterated. Village women (left) who live outside Nagarahole must now walk more than three miles across a denuded landscape every day to find enough wood to cook meals for their families.**

once common throughout the southern half of the Ghats, but poaching and the steady loss of their habitat have reduced their numbers to fewer than 2,500, most living in small, scattered bands whose future is at best uncertain. Roughly a third of them endure here unmolested, beneficiaries of a unique partnership between the state forest department and the successors of the planters who had altered the ecology of the lower slopes forever.

Our host at Munnar is a senior manager of the sprawling gardens belonging to the Tata Tea company and the man most responsible for making that all-important alliance work over the past few years. K. N. Changappa—"Chengu" to his friends—is a tough but soft-spoken 33-year veteran of the tea industry whose love for his region and its wildlife is contagious. As we drive up toward the park, he explains how this unique sanctuary was established. "British planters started it in 1928 as an exclusive reserve. Already the tahr were disappearing." A planters group, the High Range Game Preservation Association, ran it and turned their hunting guides from the local Muduvan tribe into game-watchers. When the state took over the unplanted areas in the 1970s, the association persuaded the forest department to declare the Eravikulam plateau the first national park in Kerala and to share its management. "We changed our name to the High Range Wildlife and Environment Preservation Association after shooting was outlawed," Chengu continues, and he has been its chairman for many years. "We still pay the tribal watchmen. We're working to control tourist traffic: Only 5,000 visitors came to see the tahr in 1993; in 2000 there were more than 150,000. And we've undertaken a large-scale program to regenerate shola."

The surroundings are spectacular, but life on these sheer, rain-drenched slopes is remote and

Uncertain Dawn

A native peacock prepares to leave the safety of his night's roost in the heart of Bandipur. He keeps guard against forest predators, but humans pose the greatest threat to the survival of his world.

often arduous. "People ask me how I could have stayed here for so long," Chengu says. "But for me every day is different. Something always happens." We are passing through a forested ravine, and, as if on cue, a massive bull gaur rushes out of the undergrowth, then halts, as startled to see us on the narrow hillside road as we are to see him—but considerably more indignant. He rushes at us twice, snorting and tossing his horns, before crashing back into the forest. The bull must have weighed close to a ton, and the valley floor looks a very long way down. What would have happened had he decided to knock us off the road? I ask. Chengu laughs. "There's room for all of us here."

He seems to have been right. Despite everything, and thanks to a decision by the association and Tata Tea to allow as much shola to remain as profits will allow, wildlife does seem to endure around Munnar. At night pet dogs are taken inside for fear of prowling leopards, sambar deer drift down to devour the flowers in planters' gardens, and small bands of elephants file through the tea, moving from one forest pocket to another in their search for food. "They feel more secure here than they do in the farmlands below," Chengu says. "And they don't do much harm, though sometimes they do pull up a few tea plants just for the fun of it."

I wondered again at the sheer tenacity of India's wildlife if given even half a chance.

We reach Eravikulam just as the sun begins to set. The plateau, walled on three sides by steep slopes and granite cliffs, is made up of mile upon mile of dun-colored hills. Since the tahr are also dun colored, they are hard to see, but Chengu eventually locates a group of 24 animals strung out along a grassy ridge against the evening sky.

The next morning he takes us on another long mountain drive, this time to a windswept summit outside the national park. With us is C. A. Abdul Bashir, divisional manager of the Kerala Forest Development Corporation; tall and whippet thin and a reader of Thoreau, he is also a dedicated bird-watcher. As we grind slowly up through the tea gardens, then the eucalyptus groves, and finally the cloud-shrouded grasslands above them, he and Hashim compete to see who can spot the largest number of bird species. The result is more or less a draw, but our tally eventually includes four endemics—the gray-breasted laughing thrush, Nilgiri flycatcher, white-bellied blue flycatcher, and black-and-orange flycatcher. It is April, the height of the dry season, but here and there icy streams of pristine water burst from the slopes beside us as if the grasslands can contain no more.

On the summit we see more evidence of the boisterous presence of elephants. In a misguided attempt to attract casual tourists to the high country during the mid-1990s, laborers hauled building materials all the way up here and constructed an elaborate rest house. No sooner had they finished, Bashir explains, than elephants turned up and made their stately way around the building, smashing every window.

We picnic next to the battered, empty structure, now home only to two bare-legged fire-watchers. Below, a silver stream threads its way between solid walls of rain forest, then vanishes in the low-hanging clouds. Chengu is about to retire. Is he worried that his departure will weaken the alliance that has served the region so well? He shakes his head. "The company is committed to preservation. So is the state government. We need them. They need us. Unless we work together, wildlife is finished in the Western Ghats and all over India."

Not long after we begin our twisting way back down the mountain, we spot two rare black eagles circling a distant slope and get out to have a better look. There, just ahead of us, beside the rutted track, Hashim finds tiger scat. Chengu and Bashir grin. It is weeks old, bleached white and held together now only by brittle whorls of sambar hair. But it offers unmistakable proof that somehow, here among the mists some 8,000 feet above sea level and in a region largely despoiled by monoculture, a tiger continues to find enough wild prey to sustain life. It may be hard to see romance in such mundane evidence. But it's there—and so, it seems to me, is hope. □

ON OUR WEBSITE

Download our Ghats map and check out other biodiversity hotspots at **nationalgeographic.com/ngm/0201.**

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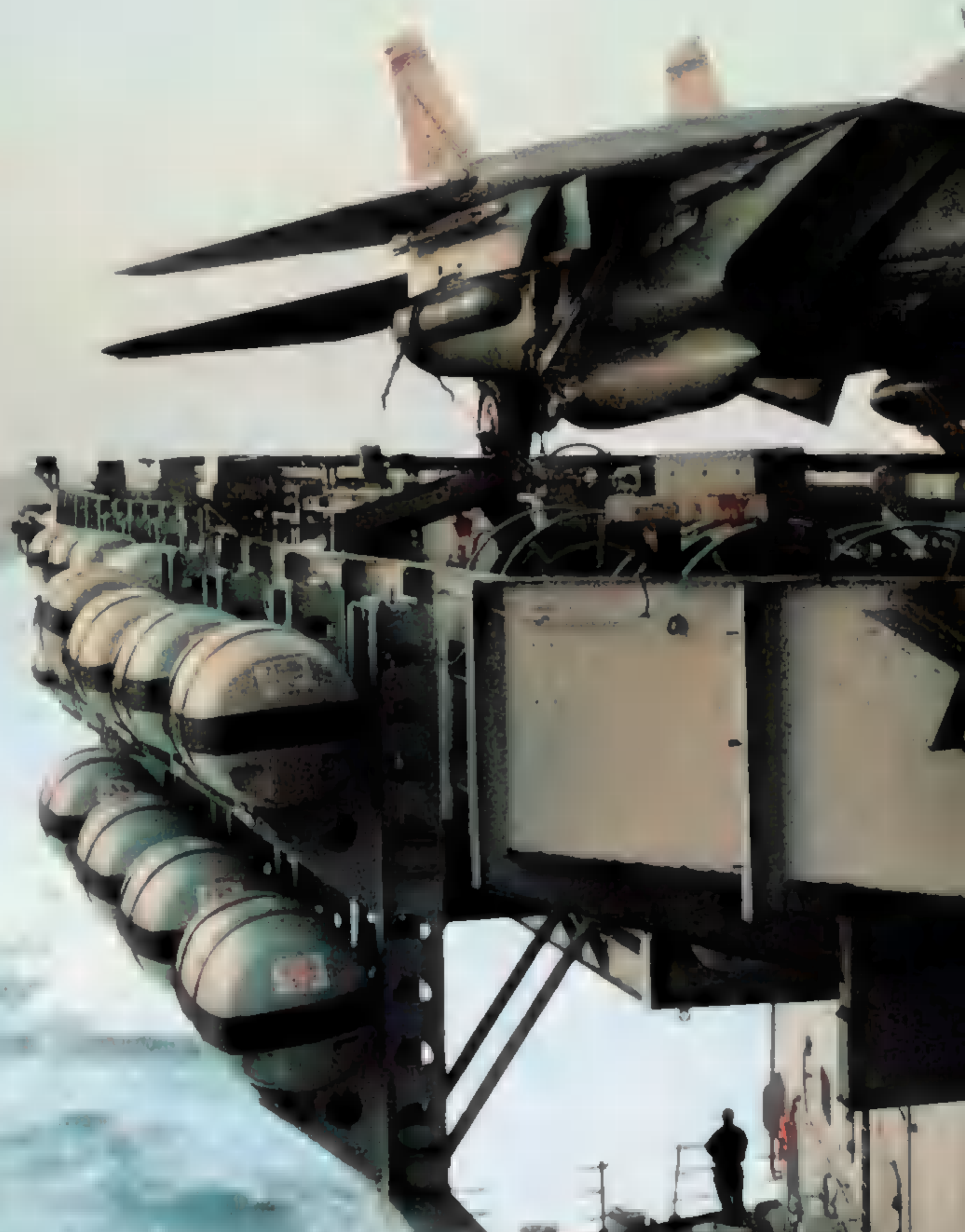
U. S. S. ENTERPRISE



Warplanes—F-14 Tomcats™ —stand ready atop [redacted] nuclear-powered [redacted] carrier *Enterprise*, mobile [redacted] [redacted] more than 5,000 sailors [redacted] patrol in [redacted] Red Sea.

09543-2810

The Big E

BY T. R. MEAD

PHOTOGRAPHS BY TERU KUWAYAMA

Sticking to schedules, one sailor eats while another carts a 500-pound [redacted]. A night fire drill is part of the routine. Afterward, a fire crew reviews its performance (right). Downtime [redacted] a fighter pilot to e-mail his family. A helicopter pilot (below) sights home after a search-and-[redacted] exercise.

The pilot was hauling mail to zip code 09543-2810, but the zip code was nowhere to be found. Twilight was falling over the eastern Mediterranean; the wine-dark sea and the darkening sky merged into a blue-gray haze, making it hard to find anything, even if the thing you were searching for was the longest, tallest, most powerful warship ever built—the U.S.S. *Enterprise*, the nuclear-powered aircraft carrier that also happens to be zip code 09543-2810. "That's why we paint 'em gray," he shouted to me over the roar of his engines. "Haze gray—makes it a little harder for the enemy to spot you."

On the balmy summer evening when I rode the C-2A Greyhound mail plane out to the *Enterprise*, the whole idea of an "enemy" sounded fantastic. But just a few days after my cruise the Big E steamed through the "ditch"—that's sailor slang for a canal, in this case the Suez—and on toward the Arabian Sea. Just a few months later the carrier was launching air strikes against Afghanistan. (The mission prompted military officials to ask the media to omit crew members' names.)

That's the whole point of a ship like the *Enterprise*, of course, with its 4.47-acre flight deck, its eight air-wing squadrons, its Sea Sparrow missiles, and some of the most sophisticated electronic spying equipment ever devised. Its mission is to carry U.S. military force within striking range of any point on the planet. To do that, the ship carries a community—more than 5,000 sailors—around the world. Like other communities, the Big E has bakeries, a barbershop, a bank, a library, a museum, a health club, a fire department, a jail, a daily newspaper, radio and TV stations, and a general store. And it has its own zip code.

Even now, when every crew member has access to e-mail, "we still get 5,000 pounds of mail a day on the average," says the top postal clerk. "You just see the morale of the crew go up when we announce mail call."

That sounded familiar; back in my Navy days, mail call was always a high point. In fact a lot about shipboard life seems unchanged. Young sailors still quake a little when they pass an admiral in the tight gray passages. The PA system still barks "Now hear this" just when you're falling asleep.

But there's one thing the *Enterprise* has today that was unthinkable during my career: women. They have served in the Navy since the Civil War, but none were assigned to combat ships until 1993. *Enterprise*'s 1999 deployment was the carrier's first to include female enlisted personnel; women sailors now make up 10 percent of the crew and 3 percent of the pilots aboard.

[redacted]-2810

FIRST MILITARY OPERATION:
Cuban missile crisis, 1962

[redacted] Classified,
but 30-plus knots

[redacted] AGE OF CREW: 25

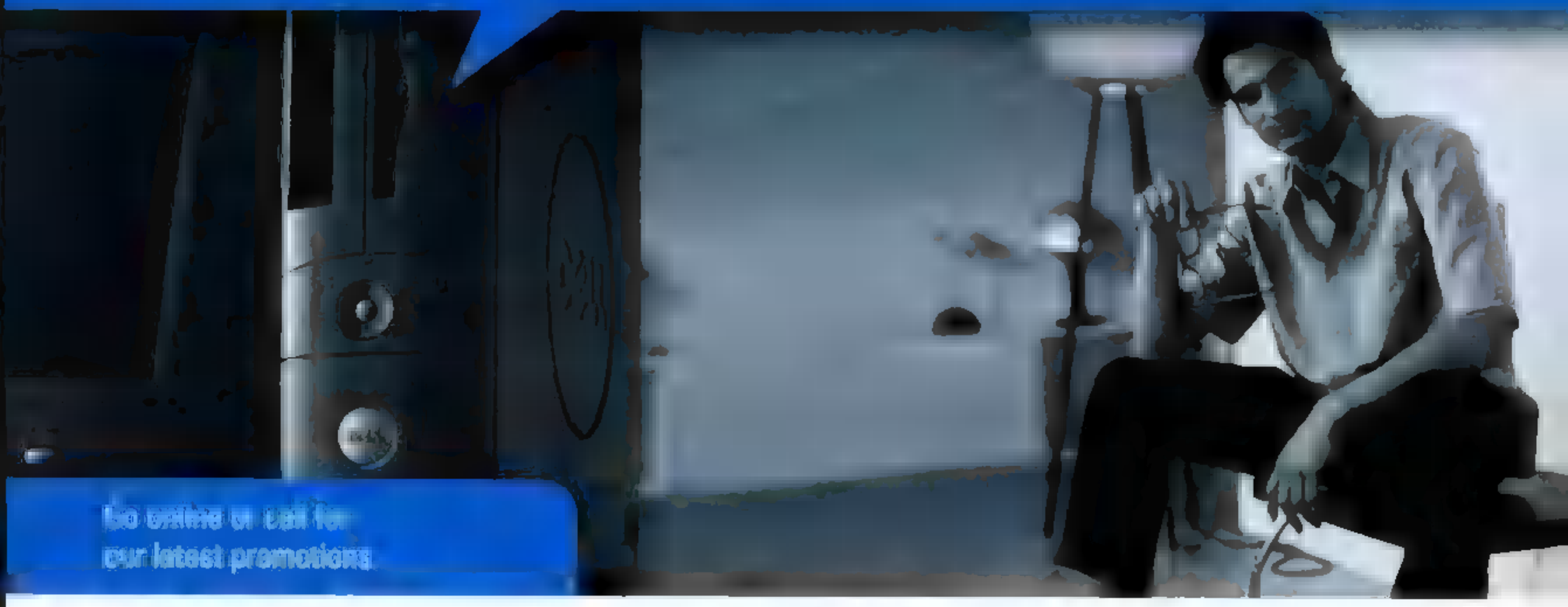
NUMBER OF NEW PARENTS DURING MOST RECENT DEPLOYMENT: 75

[redacted] 27,000

WISDOM TEETH PULLED:
1,300

SOFT DRINKS BOUGHT FROM [redacted] MACHINES:
720,000

Nothing must escape [redacted] eyes of the flight-deck crew [redacted] they take [redacted] FOD (foreign object damage) walk. They search for debris that could get sucked into an engine and cause [redacted] plane [redacted] [redacted] down.



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Boning up on homework, a "mess specialist"—cook—studies meat cuts for a professional cooking class offered on board. Crew may also take college courses in English, math, history, and criminal justice.

For sailors, male or female, sea duty is a round-the-clock thing. "They say the *Enterprise* is like a city that never sleeps," the ship's supply officer told me late one night in one of the four big mess decks he runs.

Most of their time is primarily dedicated to launching and landing airplanes on the ship's two runways. The *Enterprise* air wing has 250 pilots, but to get them airborne requires thousands of other sailors who plan each flight, maintain the planes, move them on massive elevators from the hangar deck to the flight deck, maneuver the ship so that the head wind is "sweet" across the deck, crew the rescue helicopters, and organize the launches so that jets bristling with bombs and missiles can safely take off within seconds of one another. The Big E's catapults—basically industrial-strength slingshots driven by steam—fling a 30-ton aircraft to full flight in a space shorter than a football field. The pilots go from zero to 165 miles an hour in two seconds.

Landings are even more astonishing. Commercial pilots generally get more than a mile of runway to land their planes; carrier pilots have about 350 feet. Hurtling down from the sky onto the floating sliver of flight deck, the jets must come in at precisely the right angle and position to hook one of the four huge arresting cables—pilots call them wires—that will bring the plane almost instantly to a dead stop. The pilots have to complete this maneuver with engines at full power, in case they miss all four wires and need to roar off again into the sky. (It happens a few times every day.) It's so heart stopping, particularly the first time, that an old Navy aphorism says no pilot ever forgets that first carrier landing.

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Prayers for peace and safety [illegible] participants at a flight-deck service [illegible] the Big E powers through the Suez Canal.

High up on the *Enterprise*'s bridge, six decks above the flight deck, I was watching F-14 Tomcat fighters rocket off the ship one day, their twin engines gushing fire. I heard a friendly voice behind me: "That is the ultimate in motor sports." I turned around and saw a dashing Navy pilot right out of central casting—gaunt, handsome, suntanned, bursting with confidence. This was the ship's commanding officer. By federal law the CO of the *Enterprise* has to be a Navy flier. This man definitely qualifies; he's notched up some 800 carrier landings over 22 years.

To test the old aphorism, I asked the CO if he could remember his first carrier landing. "Well, sort of, I guess so, vaguely," he began. "Let's see, it was December 1979. I was bringing a T-2 onto the *Eisenhower* off Key West. Calm day, moderate wind. Angle of attack was good. I hit the 4 wire. I pulled off my helmet, ran straight to a phone, and said, 'Dad, I did it!'"

The Big E's pilots keep doing it, so that the carrier can live up to its motto: Ready on arrival. That readiness depends on the whole community—the navigators up on the bridge, the reactor technicians in the bowels of the ship, the butchers, the bakers, the parachute makers.

"I joined the Navy to see the sea, but I don't see much of it down here," said the head parachute rigger, who spends his days working at a long table surrounded by silk thread and sewing machines in the Big E's parachute packing room. "But I know I'm part of the Navy because I save the lives of Navy pilots. You know our motto, don't you, the motto of the parachute shop? 'We're the last to let you down.'" □

MORE INFORMATION

ON OUR WEBSITE There's more on 09543-2810 at **nationalgeographic.com/ngm/0201**. Tell us about **YOUR FAVORITE ZIP CODE** at **nationalgeographic.com/ngm/zipcode/0201** or mail your idea to PO Box 96095, Washington, DC 20090-6095. E-mail: **zip@nationalgeographic.com**

LEGAL NOTICE

If you bought radial tires made by Cooper Tire & Rubber Co., a proposed settlement may affect your rights.

Para una notificación en Español, llamar o visitar nuestro website

A proposed nationwide settlement of class action lawsuits involving purchasers of Cooper branded and private-labeled Cooper-made tires ("Cooper Tires") has been reached in *Talalai et al v. Cooper Tire & Rubber Company*, No. L-008830-00-MT, and preliminarily approved by the Superior Court of New Jersey, Middlesex County (the "Court"). **Personal injury or property damage claims are not involved. This is not a recall.**

The proposed settlement includes, among other things, an enhanced warranty that provides a free replacement tire or an alternative dispute resolution system if you experience an "Adjustable Separation" in your tire as noted below.

Who is affected?

Many independent retailers sell Cooper Tires, some under their own brand name. Check the DOT code on the side of your tire (see the illustration) to see if it was made by Cooper. The website below contains a list of various brand names under which Cooper Tires have been sold.

You are a "class member" if you fit this description: All First Purchasers* of an Eligible Cooper steel belted radial tire in the United States or its territories and possessions, manufactured by Cooper Tire & Rubber Company in the United States (whether sold under the Cooper Tire & Rubber Company label or a private label) from January 1, 1985 until January 6, 2002, and who still retain said tire, excluding: (a) Defendant; (b) consumers who have sustained personal injury and/or property damage; (c) any Used Tire Business; and, (d) any judicial officer(s) presiding over the Related Actions.

Are your tires included?

Regardless of the brand name of your tire, by checking the sidewall you can determine whether it was made by Cooper. If the "DOT" is followed by: U9, 3D, UT, or UP, then your tire was made by Cooper.

What is the case about?

This class action and related lawsuits claimed that Cooper did not disclose alleged adhesion problems between tire layers or manufacturing methods to remove inner liner blisters, among other allegations. Cooper denies all allegations, and has asserted numerous defenses. The settlement is neither an admission of wrong doing nor indicates a violation of any law.

What does the settlement provide?

The proposed settlement creates a five year Enhanced Warranty Program providing either a free replacement tire or an alternative dispute resolution system (ADR), if you have an Adjustable Separation on an Eligible Cooper Tire. Class members can receive a free replacement tire (including balancing, mounting, and disposal costs, except for medium truck tires, which include mounting and disposal costs only). Instead of free replacement, you may choose an ADR process. Under the ADR option, you must submit a verified claim form and any supporting documents.

Generally, an Adjustable Separation means a separation between plies, belts, tread, the liner and the body, the sidewall, at the wing and tread junction, at ply turn-up, between ply and belt, at rim flange, a distorted tread (radial tires), and/or pick cord-wicking. Further details on this and which tires are eligible can be obtained by calling or visiting the website.

Cooper has also agreed to implement an Enhanced Finishing Inspection Program, and a Consumer Education Program that will focus on tire maintenance, actions to take in the event of a separation, and how to identify possible precursors to a separation.

For more detailed information about the benefits under the settlement, call or visit the website below.

What are your rights and options?

If you do not wish to participate in or be legally bound by the settlement, you must exclude yourself as described in the detailed notice, by January 15, 2002 or you will be barred from pursuing any legal action against the defendant relating to the settled disputes. If you exclude yourself, you will NOT be eligible for the Enhanced Warranty Program benefits. If you stay in the class, you may comment on, or object to, the terms of the proposed settlement by January 15, 2002. The detailed notice describes how to submit comments or objections. The Court will hold a hearing on January 29, 2002 to consider whether to finally approve the settlement and Class Counsels' fees of no more than $27.5 million for prosecuting the actions, and fees and expenses of no more than $2.5 million for implementing the settlement. You may appear at the hearing, although you do not have to do so.

For a detailed notice or more information, call toll free 1-877-370-2493, see the website www.coopertirelitigation.com, or write to Cooper Tire Litigation, P.O. Box 36, Excelsior, MN 55331-0036. PLEASE DO NOT CONTACT THE COURT.

**A "First Purchaser" is a retail puchaser, or end user, of an Eligible Cooper Tire purchased new at retail and installed on a vehicle owned or leased by such retail purchaser.*

1-877-370-2493 **www.coopertirelitigation.com**

Final Edit

SIMON AND KODA DOG PROVIDED BY DOUG SEUS'S WASATCH ROCKY MOUNTAIN WILDLIFE, UTAH

EVOLUTION OF DOGS

Facing the Future

Even with its battery removed, an Aibo robot got the full attention of Koda the wolf and Simon the Maltese during a studio shoot. Koda, a trained captive-born wolf, had worked with Simon but not with the robot. At first he moved away from the motionless Aibo, says photographer Robert Clark. Then, curious, he sniffed it and chewed off a plastic ear. Doug Seus, Koda's owner and trainer, says that while dogs can easily form new relationships after they are about six months old, wolves are genetically programmed not to accept strangers. "It's a built-in survival technique to limit the size of the pack." Confronted with the unknown, wolves are either extremely timid or extremely aggressive, he says. "They may look like a big dog, but they're psychologically different."

MORE ON OUR WEBSITE

Cut it or keep it? Find out what tipped the balance for this photo and send it as an electronic greeting card at **nationalgeographic.com/ngm/0201. AOL Keyword: NatGeoMag**

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COVERING THE WORLD

joined [illegible] van [illegible] (in [illegible], and David [illegible] Smith (second [illegible] of [illegible] Geo- [illegible] [illegible] were [illegible] scientists, a [illegible] and [illegible]. "We had [illegible] [illegible] gave [illegible] first day. "It was a [illegible] in [illegible]," he [illegible]. "It was terrible [illegible] pictures." For a [illegible] desert [illegible] that he [illegible] taking [illegible] in the [illegible] would [illegible].

CLARK (ABOVE); ROBERT CLARK AND SADSHA SEUS

POINT OF VIEW

Dogged Photography

When the owners and trainers of the diverse group of dogs pictured on pages 5-7 and above learned that **Robert Clark** (right, at center) planned to photograph all the dogs together, "they thought we were crazy," says illustrations editor **Kurt Mutchler,** at far right. "They said getting all the dogs to look good and behave at the same time would be like, well, herding cats." But over a four-hour session "the dogs really hung in there," says Kurt. "The result is real, not a digitally altered image: What you see is what we got."

Just as unlikely was the cover photo joining a dog and a wolf. Robert, his assistant Michael Altobello, at far left, and Kurt traveled to Heber City, Utah, where Doug Seus, second from right, and Clint Youngreen, second from left, trained Clint's Maltese, Simon, and Doug's gray wolf Koda to pose together. "That wolf was a spectacular animal," says Kurt.

WORLDWIDE

Photographer **Frans Lanting** (below, with his wife, Christine Eckstrom) discovered this traditional round boat made of water buffalo hide "more stable than you might think" as he documented the "splendid" ecosystem of India's Western Ghats. Frans has photographed wildlife throughout the world. "Working with animals is easier than finding your way through bureaucracies," he says.

NEHA DIDDEE

After serving as the *Washington Post*'s Tokyo bureau chief, **T. R.** [redacted] moved to the London bureau, sure that the future belonged to Asia and that Europe's heyday was over. "But Europeans didn't agree; they think they are the 21st century," he says. Covering the New Europe led Reid to change his mind, even though he lives in one of the three European Union (EU) nations that haven't yet embraced the euro. "The British aren't sure which continent they belong to. Some want to be part of a 51st U.S. state."

Reid traveled around the continent in a rented BMW with British photographer **Stuart Franklin.** Why a BMW? "You can drive long distances without getting tired, and you're not constantly being overtaken by Germans on the autobahn," Stuart says. He drove in almost every EU country and came to feel that watching the New Europe develop was "almost a geologic process, like watching the Alps being formed: It was so big, inevitable, and irreversible." The biggest surprise: "The incredible openness the Finns have to new technology and new ideas."

MORE ON [redacted] WEBSITE

Find more stories from our authors and photographers, including their best, worst, and quirkiest experiences, at **nationalgeographic.com/ngm/0201.**
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Flashback

WORLD OF ISLAM

Friends in High Places

The king of Afghanistan perused his own copy of the GEOGRAPHIC for photographer/writers Jean and Franc Shor in April 1949. The husband-and-wife team had arrived in Kabul to ask the permission of Mohammed Zahir Shah—a longtime Society member—to be the first Westerners to fully explore the mountainous Wakhan Corridor. "He alone was giving us the chance to continue our journey," wrote Jean Shor. "I wanted to give him something in return, so I handed him our Polaroid camera. He seemed a little startled. . . . How was I to know that kings customarily accept presents only from other kings?"

The Shors' article "We Took the Highroad in Afghanistan" appeared in November 1950, but this photograph was never published in the magazine. The king, now 87, was deposed in a 1973 coup. He is currently helping plan a new government for his country.

MORE ON OUR WEBSITE

You can find this image as well as access the Flashback photo archives at **nationalgeographic.com/ngm/flashback/0201.**

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Photographed by Luis A. Mazariegos

WILDLIFE AS CANON SEES IT

Appearing suddenly at forest edge, a colorful puffleg quickly extracts a flower's high-energy nectar. In an instant, he disappears back into the shadows of the mist-shrouded forest. Males of this species display an iridescent green, indigo and coppery red plumage, while females sport coppery green disks along their sides; both have large white puffs at the base of their legs. First discovered in 1967 in Colombia's Munchique National Park, the colorful puffleg was unseen for nearly three decades. Now, few in number and limited in range, the species is especially vulnerable to disturbance of its forest habitat.

As a global corporation committed to social and environmental concerns, we join in worldwide efforts to promote greater awareness of endangered species for the benefit of future generations.

Colorful Puffleg
(Eriocnemis mirabilis)
Size: Length, 8 cm
Weight: 3.5 g
Habitat: Cloud forest on the Pacific slope of the Andes in southwest Colombia
Surviving number: Estimated at 50-250